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DEPARTMENT OF FISH AND GAME

Jerry M. Conley, Director

FEDERAL AID IN FISH RESTORATION

Job Performance Report

Project F-71-R-12

REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS

Job No. 5-b. Region 5 Lowland Lakes and Reservoirs Investigations
Job No. 5-c. Region 5 Rivers and Streams Investigations
Job No. 5-d. Region 5 Technical Guidance

By

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Job No. 5-d.__Region 5 Technical Guidance

JOB PERFORMANCE REPORT

State of: **Idaho** **Project Name:** **REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS**

No.: **F-71-R-12**

Title: **Region 5 Lowland Lakes and Reservoirs Investigations**

Job No.: **5-b**

Period Covered: **1 July 1987 thru 30 June 1988**

ABSTRACT

Age and growth of largemouth bass from Twin Lakes Reservoir were investigated. Nearly all largemouth bass sampled (95%) were less than 250 mm in length. The low PSD calculated for the sample (.09) is probably not an accurate reflection of the actual population because of poor electrofishing conditions. Eighty-seven percent of all bass collected were age II+ or less and the oldest fish was aged at V+. Growth of age V+ and younger bass in Twin Lakes is comparable to bass growth in other Idaho waters and those at similar latitudes.

A total of 90 bluegill were aged from Twin Lakes Reservoir. These fish averaged 126 mm in total length and ranged from 81 to 176 mm. Age I+, II+, and III+ fish comprised 59, 33, and 8X of the sample, respectively. No bluegill older than age III+ were collected. Growth of age I+ bluegill in Twin Lakes is somewhat elevated above other intermountain waters but lack of annulus formation during the first year may account for these results.

A total of 1,052 Bear Lake cutthroat were trapped at the Little Blackfoot weir from 5 May through 2 June 1987. The mean size of both males and females in the run were well above those observed the previous year, primarily due to a lack of age III spawners this year. Overall survival to eye-up was 50.2%, or twice that obtained during the 1986 run. Poor egg survival continues to hamper the program.

We checked 719 anglers from Blackfoot Reservoir between 23 May to 27 June. They averaged 1.26 trout/angler and harvested .26 trout/hour. The June harvest rate was well below those observed during the previous two years. Bear Lake cutthroat comprised a smaller percentage of the creel in 1987 than in the previous two years, presumably because of reduced fingerling plants.

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OBJECTIVES

1. Monitor the sports fishery at Blackfoot Reservoir to continue the evaluation of the Bear Lake cutthroat program.

2. To obtain largemouth bass age and growth data from Twin Lakes to aid in future evaluation of the statewide bass regulation.

3. To obtain data on bluegill age and growth in Twin Lakes Reservoir.

4. To monitor the sports fishery at popular fishing reservoirs in Region 5.

RECOMMENDATIONS

1. Conduct more intensive evaluations of age and growth of largemouth bass and bluegill in Twin Lakes and additional S.E. Idaho reservoirs.

2. Conduct a complete creel census on Blackfoot Reservoir to evaluate the success of the Bear Lake Program. The current evaluation, limited to spot creel checks, is insufficient for program evaluation.

3. Work with Grace Hatchery personnel on improving egg to fry survival of eggs taken at the Little Blackfoot weir. Evaluate other potential weir sites.

TECHNIQUES

Twin Lakes

Largemouth bass and bluegill populations in Twin Lakes Reservoir were sampled on 5-7 August using a Cofelt VVP 1,500-watt generator and 2 stationary booms mounted a 5-m long river sled. All electrofishing was conducted at night to improve capture efficiency.

Total lengths and weights, to the nearest mm and g, respectively, were recorded for all largemouth bass sampled as well as from a representative sample of bluegill. Scale samples were taken from representative groups of both species. Scales were pressed and analyzed using a digitizing pad, a Bausch & Lomb projector, and the Apple DISBCAL program developed by Frie (1983). A maximum of 10 fish per 10 mm size group were used in the scale analysis. A geometric mean functional regression was used to determine back-calculated lengths at age (Ricker 1973).

Length and age composition, average annual growth increments, instantaneous growth rates, and mean lengths at age were determined for both species. Proportional stock densities (PSD) (Anderson 1980) and relative weights (Wr) (Wege and Anderson 1978) were also calculated for largemouth bass. PSD values express the percentage of the stock that is of quality size:

$$PSD(\%) = \frac{\text{number of fish > quality size x 100}}{\text{number of fish > stock size}}$$

Stock and quality sizes for largemouth bass were as recommended by Anderson (1980) at 200 mm and 300 mm, respectively. An index of fish condition, relative weight (W_r), was calculated as:

$$Wr\ \frac{W}{W_s} \times 100$$

Where:

W = the measured weight of an individual fish, and
W_s = the standard weight.

W_s values are derived using species-specific standard weight equations. The standard weight equation for largemouth bass was developed by Wege and Anderson (1978):

$$\log_{10}W_s - 5.316 + 3.191 \log_{10}L$$

Where:

W_s = the standard weight in grams, and
L = the total fish length in millimeters.

Blackfoot Reservoir

We aided Grace Hatchery personnel in the operation of the Little Blackfoot River egg-taking facility. Mean lengths and weights to the nearest mm and g were taken from all fish collected at the weir. Water temperatures (maximum and minimum) were taken at the weir site on a daily basis. Results of this year's run in terms of timing and spawner size were compared with 1986 results.

We continued annual monitoring of the sports fishery to evaluate the success of the Bear Lake cutthroat program. We operated a check station on the opening day of the boat season (4 June) in a manner described by Heimer (1985). In addition, we conducted spot creel checks at various reservoir access points during the month of June. Wild and Bear Lake cutthroat were differentiated based on spotting patterns and their relative composition in the harvest noted.

Spot Creel Checks - Reservoirs

We collected creel census information from popular reservoirs in Region 5. Information was obtained from conservation officers, staff personnel, and fisheries management temporaries. The majority of checks were made during the early part of the season when the heaviest concentration of fishing pressure occurred. Anglers were typically checked before they had completed fishing.

RESULTS

Twin Lakes Reservoir

Largemouth Bass

We collected a total of 267 largemouth bass from Twin Lakes during the electrofishing operation. These fish ranged from 75 to 375 mm in total length and averaged 183 mm. Nearly all largemouth bass sampled (951) were less than 250 mm in length (Figure 1). A major mode in the disribution is evident at 150-240 mm indicating a strong year class.

The lack of larger bass in the sample was probably a result of the low water levels present during the sampling period. Irrigation drawdown had lowered water levels well below shoreline cover and large bass were not readily available via electrofishing. The low PSD calculated for the sample (.09) is probably not an accurate reflection of the actual population. Larger bass are present in the population as evidenced by creel survey results (Heimer 1985).

Age composition and back-calculated lengths at age were calculated for the Twin Lakes population. Ages I+ and II+ bass comprised 49 and 38% of the sample, respectively (Table 1). No bass older than V+ were collected. Estimated lengths at age and average annual growth increments calculated for Twin Lakes bass five years of age or less were similar to those determined for other southeastern Idaho reservoirs (Table 2).

The mean length at age I+ for Twin Lakes bass (93 mm) appears to be greater than that reported for northern Idaho Lakes. However, Twin Lakes bass in age classes III, IV, and V+ grew to lengths nearly identical to those in northern Idaho (Table 3). Largemouth bass sampled from Lake Lowell in southwestern Idaho consistently grew at a faster rate than Twin Lakes fish. In general, estimated lengths at age for Idaho bass populations are similar to those reported for midwest states at similar latitudes (Table 3).

The condition of individual fish expressed in terms of relative weight (Wr) remained fairly constant, throughout the range of fish sampled. Relative weights of fish age IV+ and younger ranged from 80 to 86 (Table 4). The lone bass aged at V+ had a relative weight of 106. As with

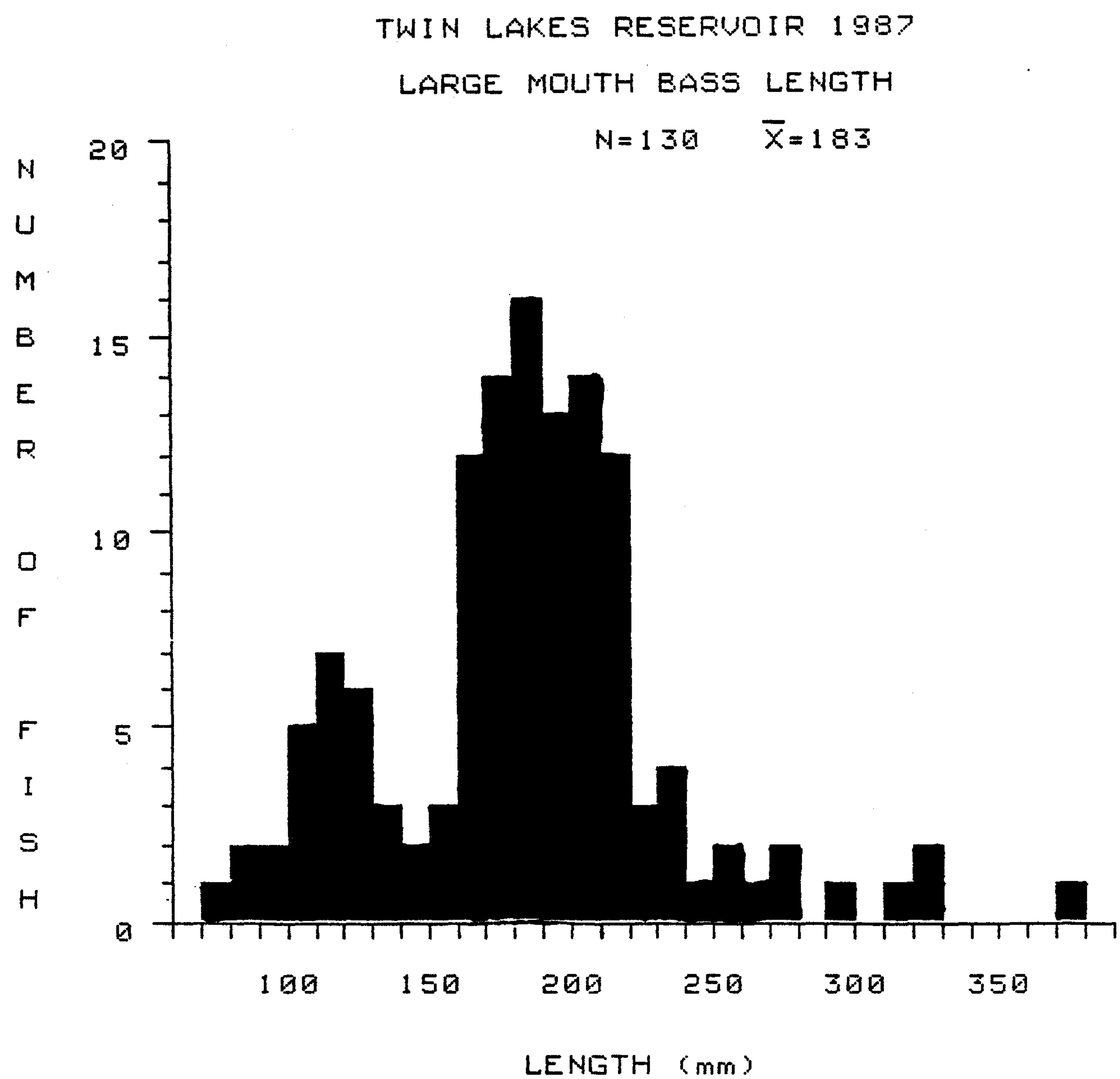

Figure 1. Length frequency of largemouth bass sampled from Twin Lakes Reservoir, by electrofishing, 5-7 August, 1987.

Table 1. Average back-calculated lengths at age (mm) and average annual growth increments for largemouth bass, Twin Lakes Reservoir, 1987.

Age class	N	$\bar{x}$ length at capture	Annulus 1	2	3	4	5
I	27	112.8	69.5				
II	78	185.7	98.5	149.3			
III	17	225.8	95.9	148.4	198.4		
IV	7	294.0	110.7	169.3	213.1	265.4	
V	1	370.0	99.3	197.3	270.4	306.4	343.3
No. of fish			130	103	25	8	1
Weighted $\bar{x}$ length			92.8	151.0	205.4	270.5	343.3
Increment of growth			92.8	52.0	49.2	50.2	36.9
Standard error of length at age			2.1	1.8	4.9	13.0	0.0
Standard error of increment			2.1	1.7	3.2	3.6	0.0

Table 2. Estimated mean[a] lengths at age (mm) and average annual growth increments (mm) for bass collected from four southeastern Idaho reservoirs during 1986[b] and at Twin Lakes Reservoir in 1987.

Reservoir	Age I	II	III	IV	V	VI	VII	VIII	IX	X
$\bar{x}$ lengths										
Twin Lakes (1987)	93	151	205	271	343					
Glendale	95	182	255	295						
Lamont	69	180	229	285	372	406	414	455	482	
Condie	109	157	210	299	337	368	411	445	459	47
Windor	76	141	196	236						
$\bar{x}$ growth increments										
Twin Lakes (1987)	93	52	49	50	37					
Glendale	95	86	75	44						
Lamont	69	102	60	62	88	51	43	41	27	
Condie	109	46	47	49	40	43	36	41	18	
Windor	76	65	46	30						

[a]Means are weighted based on the sample size in each year class.
[b]From Reimer (1987).

Table 3. Estimated mean length at age (mm) for largemouth bass in various temperate geographic locations.

Water	Age									
	I	II	III	IV	V	VI	VII	VIII	XI	X
Twin Lakes	93	151	205	271	343					
N. Idaho (6 Lakes)[a]	68	136	213	279	336	386	405	440	463	484
Hagerman[b]	72	198	296							
Lake Lowell[c]	101	181	248	299	364	424	495	479		
ID,UT,MT[d]	72	155	216	229	288	335	372	400		
MI,MN,SD,WI[d]	94	184	255	294	336	364	390	414	443	448

[a]Based on mean of six lakes in northern Idaho (Rieman 1983).
[b]From Grunder (1986).
[c]From Reid and Mabbott (1987).
[d]From Carlander (1977).

Table 4. Relative (Wr) weights at age for largemouth bass collected from Twin Lakes Reservoir in 1987 and four southeastern Idaho reservoirs in 1986. Sample size in ( ).

Reservoir	Age 0	I	II	III	VI	V	VI	VII	VIII	IX	X
Wr k											
Twin Lakes											
LMB (1987)		85(27)	86(77)	84(17)	80(7)	106(1)					
Glendale		147(2)	117(1)	107.4(4)	103.8(8)						
Lamont	89.7(1)	89(45)	92(20)	99.5(5)	136.1(1)	114.5(14)	114(4)		.	123(1)	
Condie		95(12)	66(23)	82.1(28)	86.5(2)	101(1)		101(1)	156(1)		112(1)

Mean sample W_r (%)	n	W_r	SD	SE
Twin Lakes LMB (1987)	129	85	18.1	1.59
Glendale	45	106	12.5	1.86
Lamont	91	96	14.1	1.48
Condie	69	86	15.9	1.91

other southeastern Idaho reservoirs, largemouth bass in younger age classes fell below the ideal relative weight of 100X (Wege and Anderson 1978; Anderson and Gutreuter 1983). This is most likely due to the fact that these bass are not yet fully piscivorous.

The overall relative weight calculated for 129 bass from all age classes sampled in Twin Lakes was 85. Since older age classes were not sampled the significance of this low overall relative weight value is questionable.

Bluegill

Large numbers of bluegill were observed in Twin Lakes during the electofishing operation. A total of 90 representative fish were collected for aging purposes.. These fish averaged 126 mm in total length and ranged from 81 to 176 mm (Figure 2). The mean size of bluegill collected was similar to that reported by Heimer et al. (1987) for bluegill electrofished from nearby Condie Reservoir (113 mm).

The majority (59%) of bluegill sampled from Twin lakes were age I+ fish that averaged 82.9 mm in total length at the time of first annulus formation. Ages II+ and III+ fish comprised 33 and 82 of the sample, respectively (Table 5).

The rate of growth for age I+ fish is within the observed ranged reported by Carlander (1977) but is somewhat elevated above rates reported for intermountain waters. Grunder (1984) estimated a mean length of 36.4 mm for age I bluegill at the Hagerman National Wildlife Refuge near Hagerman, Idaho. Bluegill in some slow-growing populations fail to form annuli at age I, a phenomenon that may account for our results.

Assuming that bluegill in our sample were aged correctly, we collected no fish four years of age or older. The lack of larger fish in the sample may have been the result of severe water drawdown and a lack of suitable habitat for concentrating and sampling older fish.

Blackfoot Reservoir

Little Blackfoot Spawning Run

The morpholine drip station was installed on 6 April and was operated continuously until the cessation of trapping activities. The weir was constructed on 15 April and operated until 3 June.

The first Bear Lake cutthroat entered the trap on 5 May. The run peaked on 22 May when 119 trout were trapped (Figure 3) and 53 females were spawned. Maximum, minimum, and mean daily water temperatures in the Little Blackfoot River varied considerably during the trapping period (Figure 4) but appeared to have little effect on upstream fish movement.

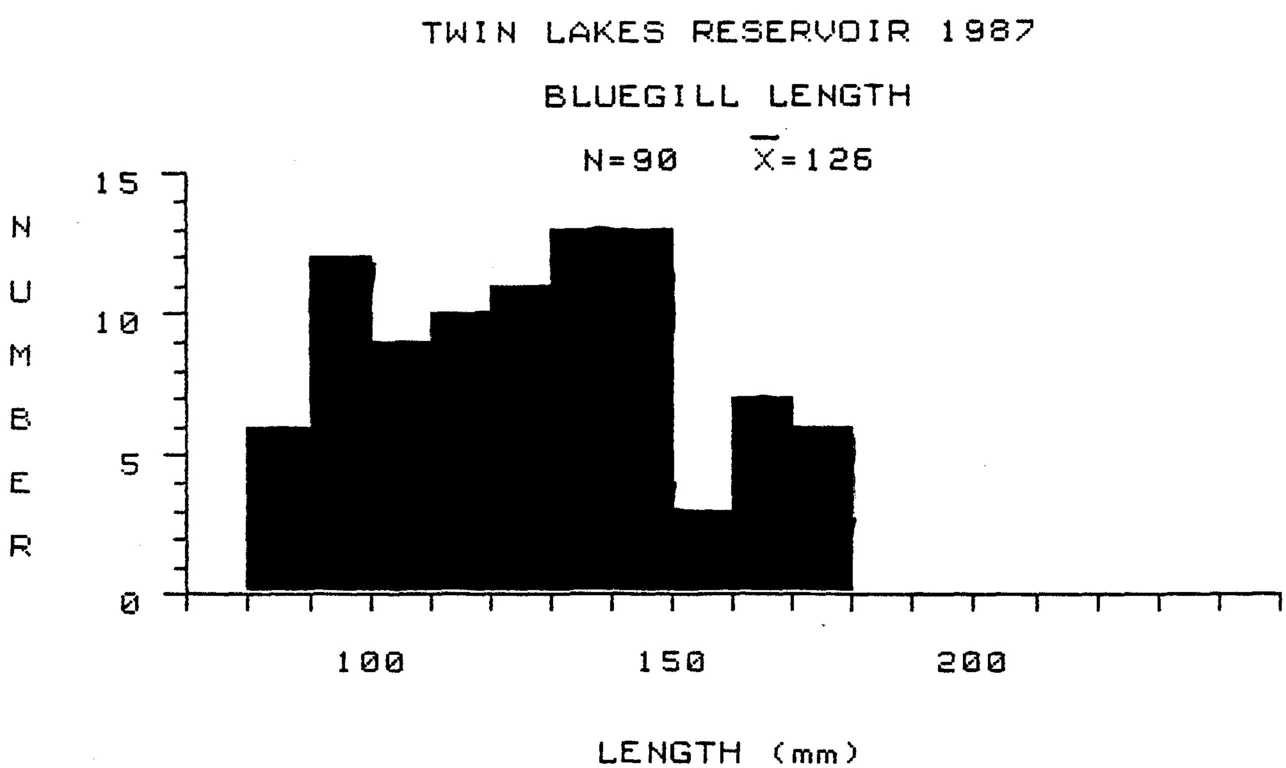

Figure 2. Length frequency of largemouth bass sampled from Twin Lakes Reservoir, by electrofishing, 5-7 August, 1987.

Table 5. Average back-calculated lengths at age (mm) and average annual growth increments for bluegill, Twin Lakes Reservoir, 1987.

Age class	n	$\bar{x}$ length at capture	Annulus 1	2	3
I	53	109.2	82.9		
II	30	146.8	91.1	126.4	
III	7	170.6	98.7	129.8	155.5
No. of fish			90	37	7
Weighted $\bar{x}$ length			86.9	127.1	155.5
Increment of growth			86.9	34.6	25.7
Standard error of length at age			1.6	2.4	4.2
Standard error of increment			1.6	1.6	2.6

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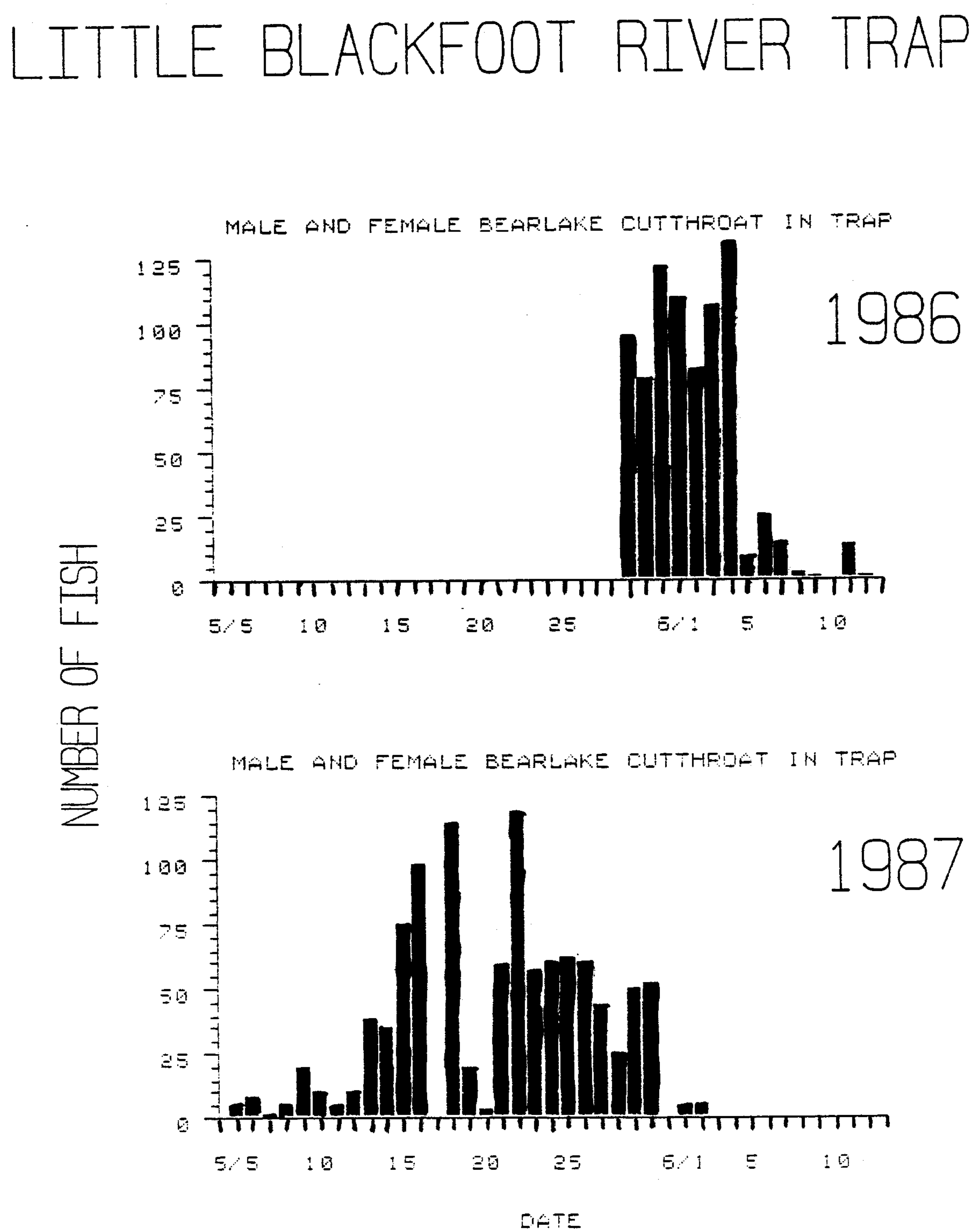

Figure 3. Number of Bear Lake cutthroat trout trapped per day at the Little Blackfoot weir, 1986 and 1987.

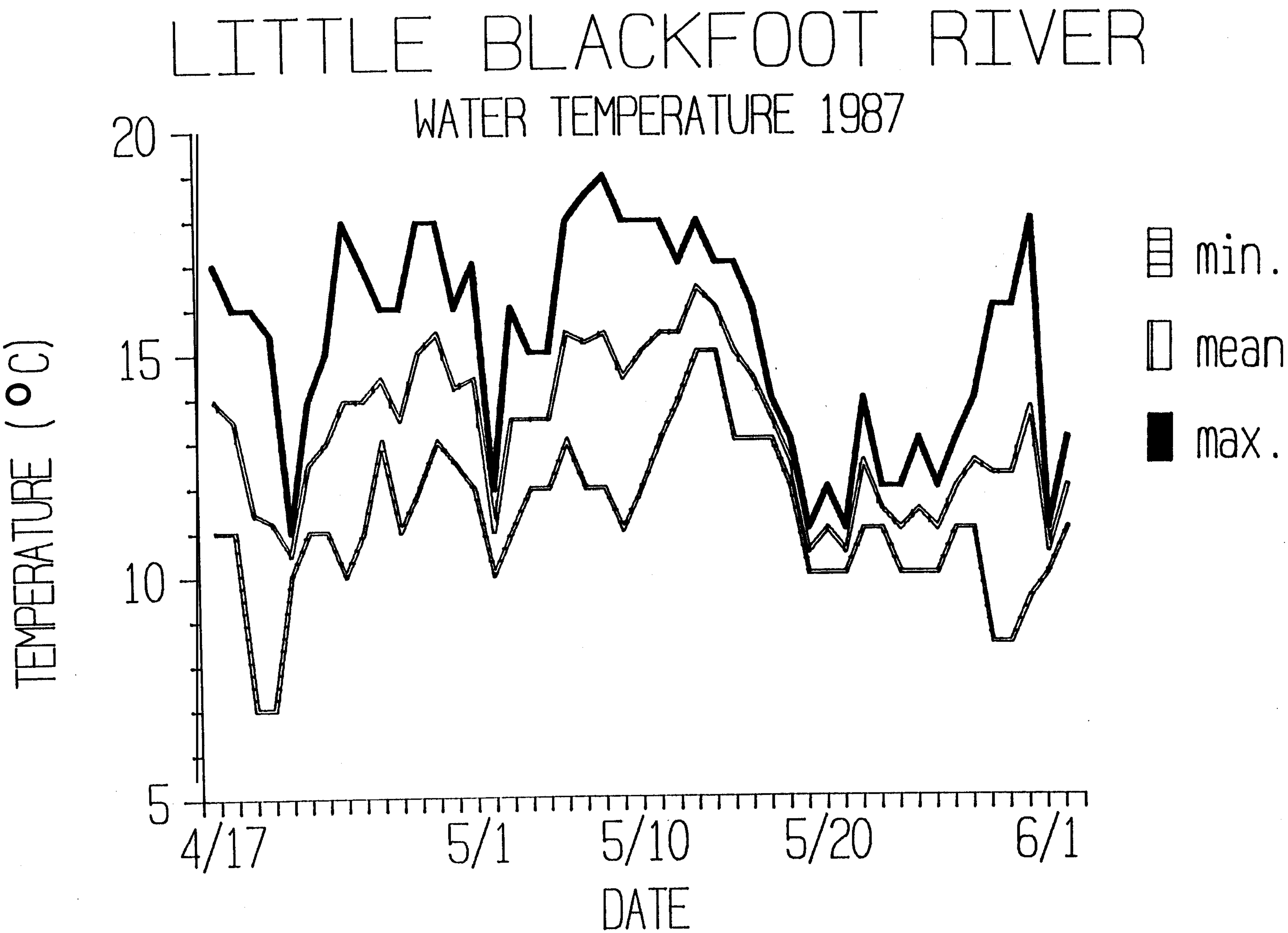

Figure 4. Water temperatures at the Little Blackfoot River weir site, 1987.

Run timing in 1987 appeared to be earlier than that reported for the previous year (Figure 3). However, during 1986 the weir was not installed until 29 May during what appeared to be the peak of the run. The exact date that Bear Lake spawners began ascending the stream in 1986 is unknown but local marina personnel first reported small numbers of fish at the mouth on 21 May. The morpholine drip station was installed nearly a month earlier in 1987. Whether earlier drip start-up influenced run timing is unknown.

The mean length of females in the 1987 spawning run was well above that of the previous year. Female cutthroat trout averaged 461 and 420 mm in length in 1987 and 1986, respectively. Heimer et al. (1987) reported known age females (age IV) trapped at the weir averaged 455 mm in length in 1986. Based on these results and length frequency analysis, the 1987 run was comprised largely of age IV females (Figure 5). In addition, we captured two adipose clipped (age V) females in 1987 that averaged 532 mm in length. A small number of additional age V females (unmarked) were trapped at the weir based on the length frequency. In contrast, the 1986 run was composed of two distinct age classes with age III fish comprising about 50% of the run (Figure 5).

The mean size of males in the 1987 run was also larger than that reported for the previous year (Figure 6). Male Bear Lake cutthroat averaged 468 and 396 mm in 1987 and 1986, respectively. Age IV males (marked) captured during the 1986 run averaged 457 mm in length (Heimer et al. 1987). Based on these results and the length frequency, it appears that the 1987 run was comprised primarily of age IV males. In addition, we captured three known age males (five years old) that averaged 508 mm in length.

A total of 1,052 Bear Lake cutthroat trout were trapped at the weir from 5 May through 2 June in 1987. Grace Hatchery personnel collected 821,000 eggs from 684 females (Bruce Thompson, IDFG, personal communication). Overall survival to eye-up for these eggs was 50.2% or twice that obtained during the 1986 run (25%).

Reservoir Fishery

During the period 23 May to 27 June, we checked 719 anglers from Blackfoot Reservoir. They fished 3,446 hours and harvested 579 hatchery rainbow, 46 wild rainbow, 77 wild cutthroat, and 201 Bear Lake cutthroat for a total of 903 trout. They averaged 1.26 trout/angler and harvested .26 trout/hour (Table 6).

Heimer et al. (1987) recommended using June catch rates for yearly comparisons because of the relative ease of contacting anglers and larger sample sizes. The June harvest rate (.28 fish/hr) was well below those observed during the previous two years (Figure 7). The decline in June catch rates is presumably the result of reduced cutthroat fingerling plants during the previous two years (Figure 8).

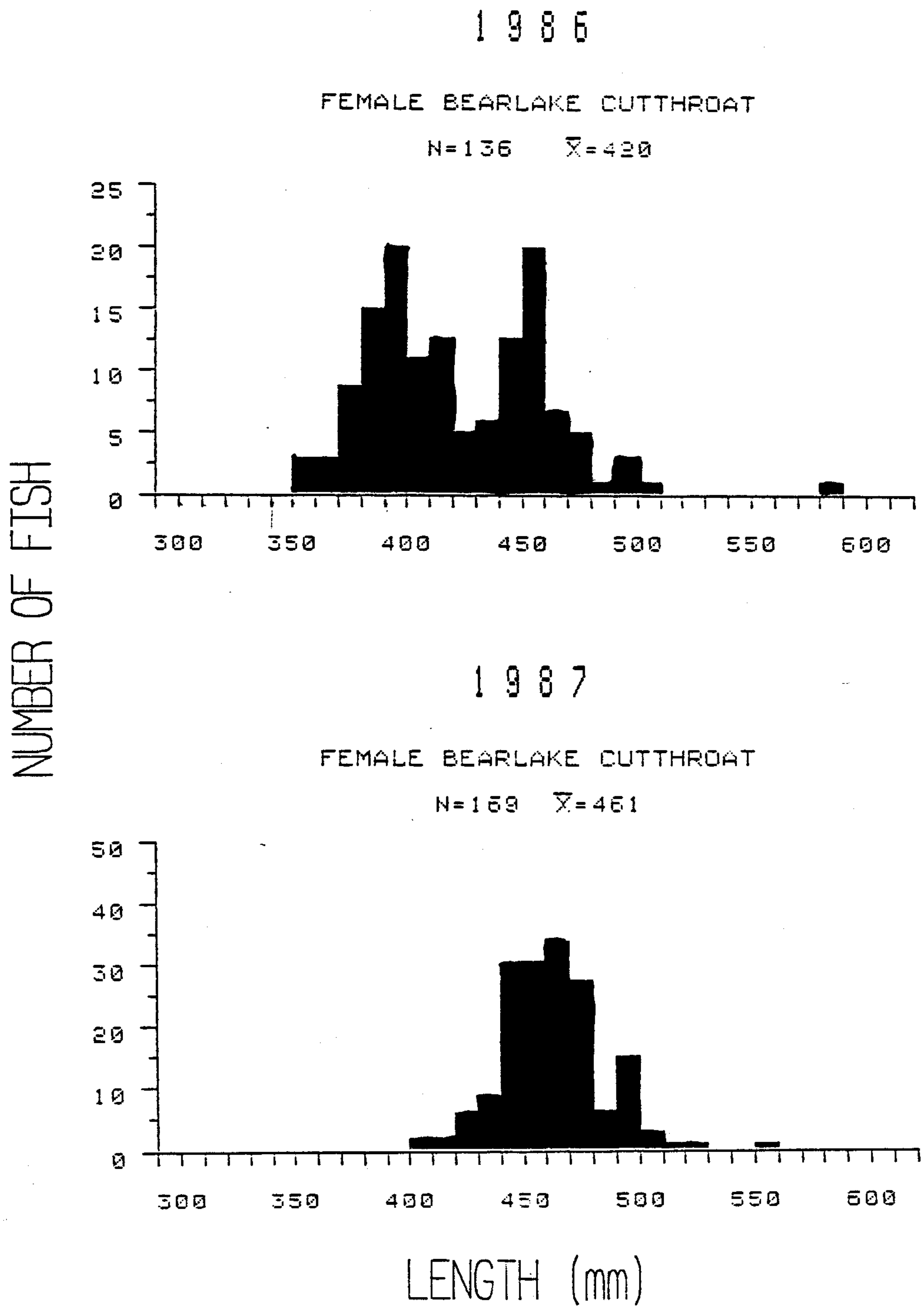

Figure 5. Length frequency of female cutthroat spawners measured at the Little Blackfoot trap, 1986 and 1987.

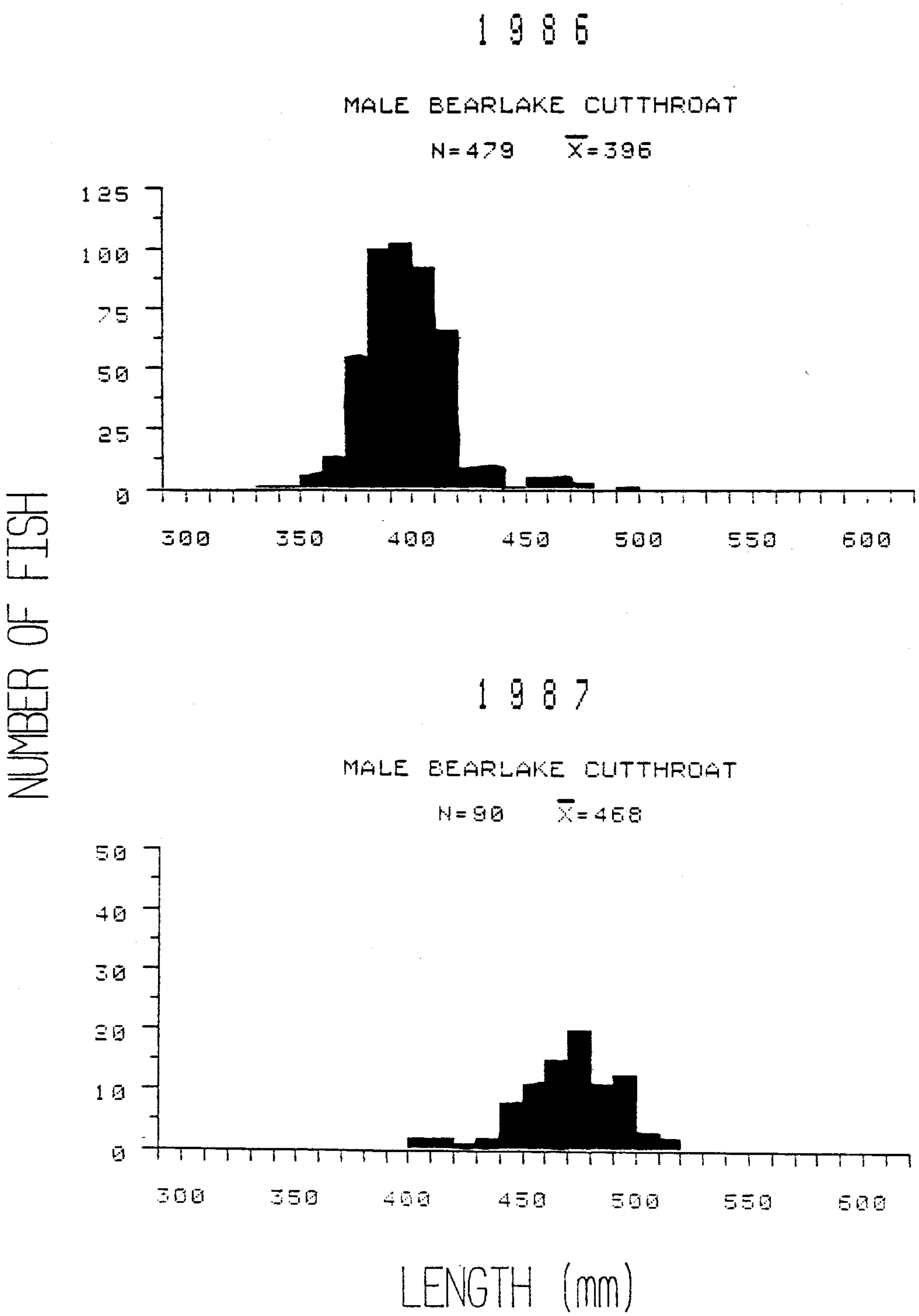

Figure 6. Length frequency of male cutthroat spawners measured at the Little Blackfoot trap, 1986 and 1987.

Table 6. Number of anglers checked, hours fished, and catch composition at Blackfoot Reservoir from 23 May to 27 June, 1987.

Two-week period starting	Number of anglers checked	Number of hours fished	Catch composition					Trout per angler	Trout per hour
			Hatchery rainbow	Wild rainbow	Wild cutthroat	Bear Lake cutthroat	Total		
23 May	475	2,519	489	36	58	196	779	1.64	.31
6 June	152	577	47	5	10	3	65	.43	.11
20 June	92	350	43	5	9	2	59	.64	.17
Total	719	3,446	579	46	77	201	903	1.26	.26

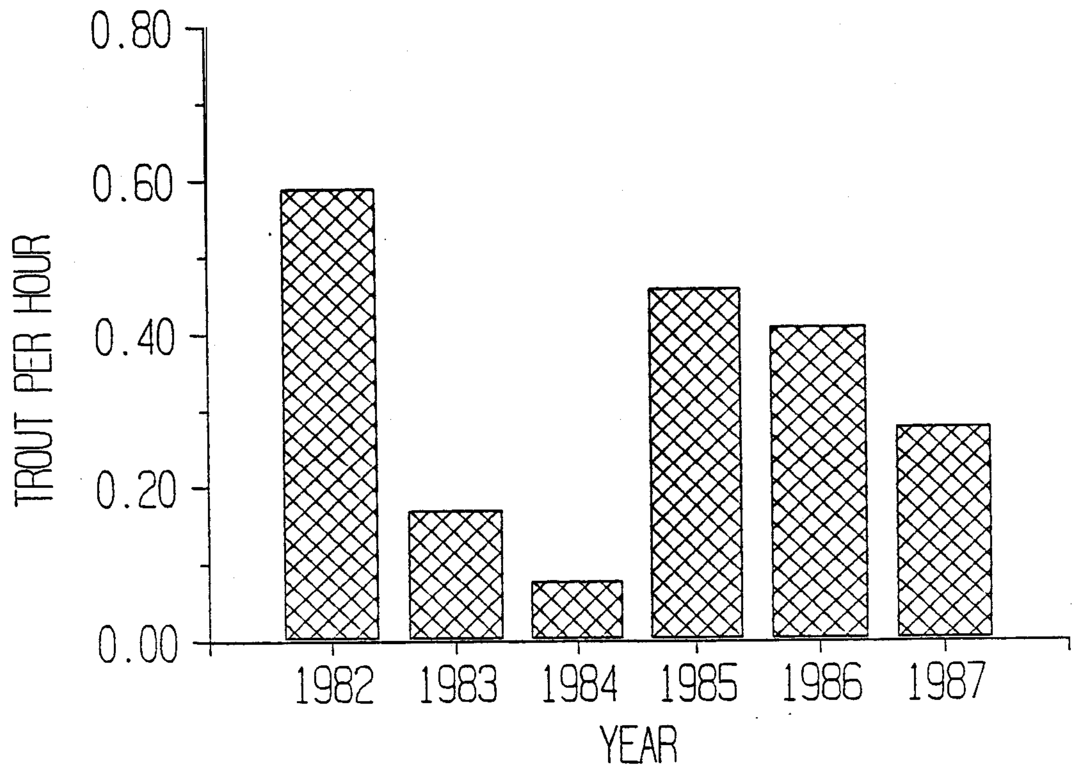

Figure 7. Trout harvested per hour from Blackfoot Reservoir during June, 1982-1987.

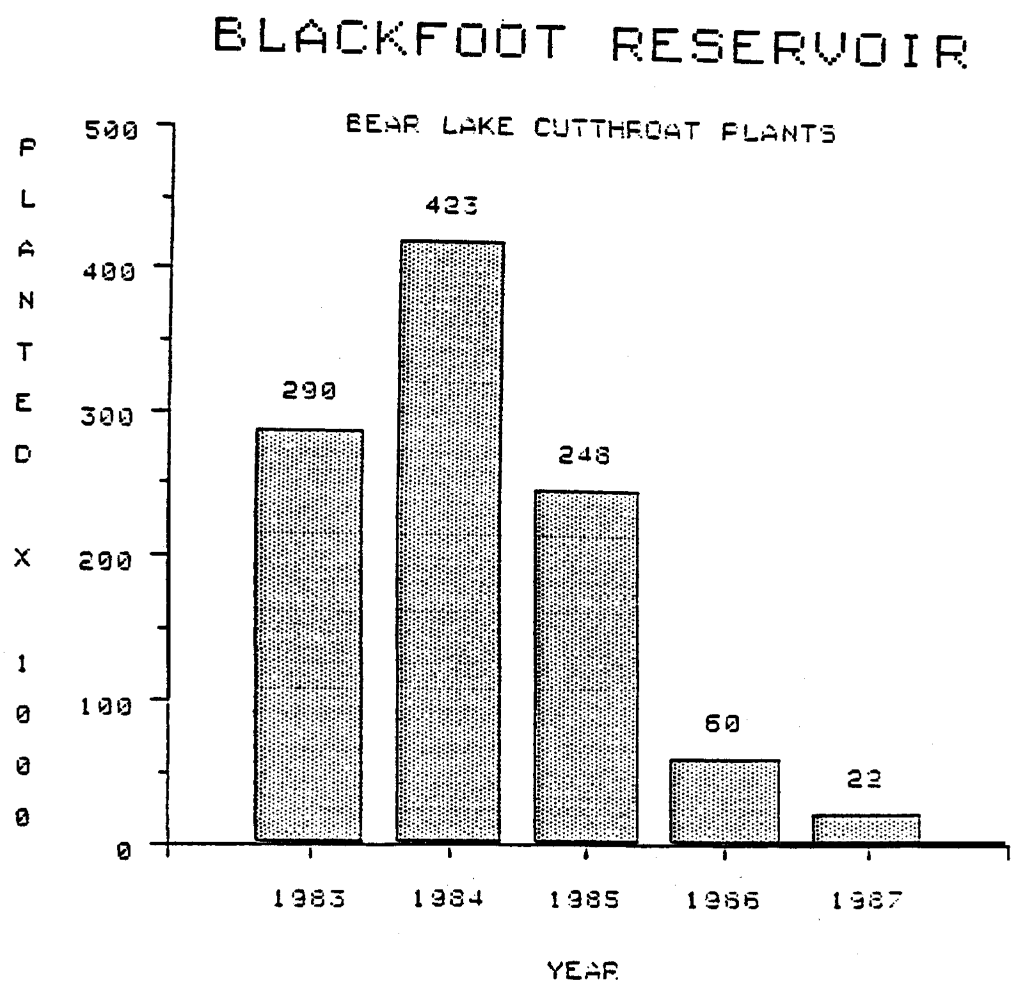

Figure 8. Number of age I Bear Lake cutthroat planted in Blackfoot Reservoir, 1983-1987.

Bear Lake cutthroat also comprised a smaller percentage of the total catch in 1987 than in the previous two years. During June 1985 and 1986, these fish comprised 50 and 602, respectively, of all trout creeled. During June 1987, only 25% of all trout harvested were Bear Lake cutthroat trout.

Although we did not conduct statistical analyses, the mean size of Bear Lake cutthroat in the 1987 creel appears to have increased above 1986 levels. Bear Lake fish harvested in 1986 and 1987 averaged 367 and 439 mm, respectively (Figure 9). As expected, Bear Lake cutthroat creeled by anglers were slightly smaller than those trapped during the spawning run.

Hatchery rainbow were the most commonly caught fish in 1987, comprising 61% of all trout harvested. The mean length of hatchery rainbow harvested during 1987 (402 mm) was similar to that observed in past years. Heimer et al. (1987) reported mean hatchery rainbow lengths ranging from 354 to 400 mm between the years 1982 to 1986.

As in past years, wild cutthroat comprised a small segment of total harvest on Blackfoot Reservoir. The percentage of wild cutthroat in the creel during June 1987 was 8%. This value has ranged from 2 to 15% during the past six years (Figure 10). Wild cutthroat trout harvested during June average 420 mm, a value similar to that observed during past years.

Spot Creel Checks - Reservoirs

Tabulated results of the spot reservoir creel checks are given in Table 7.

DISCUSSION

Twin Lakes Reservoir

Because of the lack of older age class bass and bluegill in the limited sample, the status of the Twin Lakes centrarchid population is unknown. In the late 1970s and early 1980s, Twin Lakes Reservoir supported a popular bluegill fishery noted for quality-sized fish. Although bluegill are still sought after by many anglers, the mean size appears to have declined based on angler reports and our own qualitative observations. Growth rates of bluegill in Twin Lakes should be examined closely in the near future along with the status of their primary predator, largemouth bass.

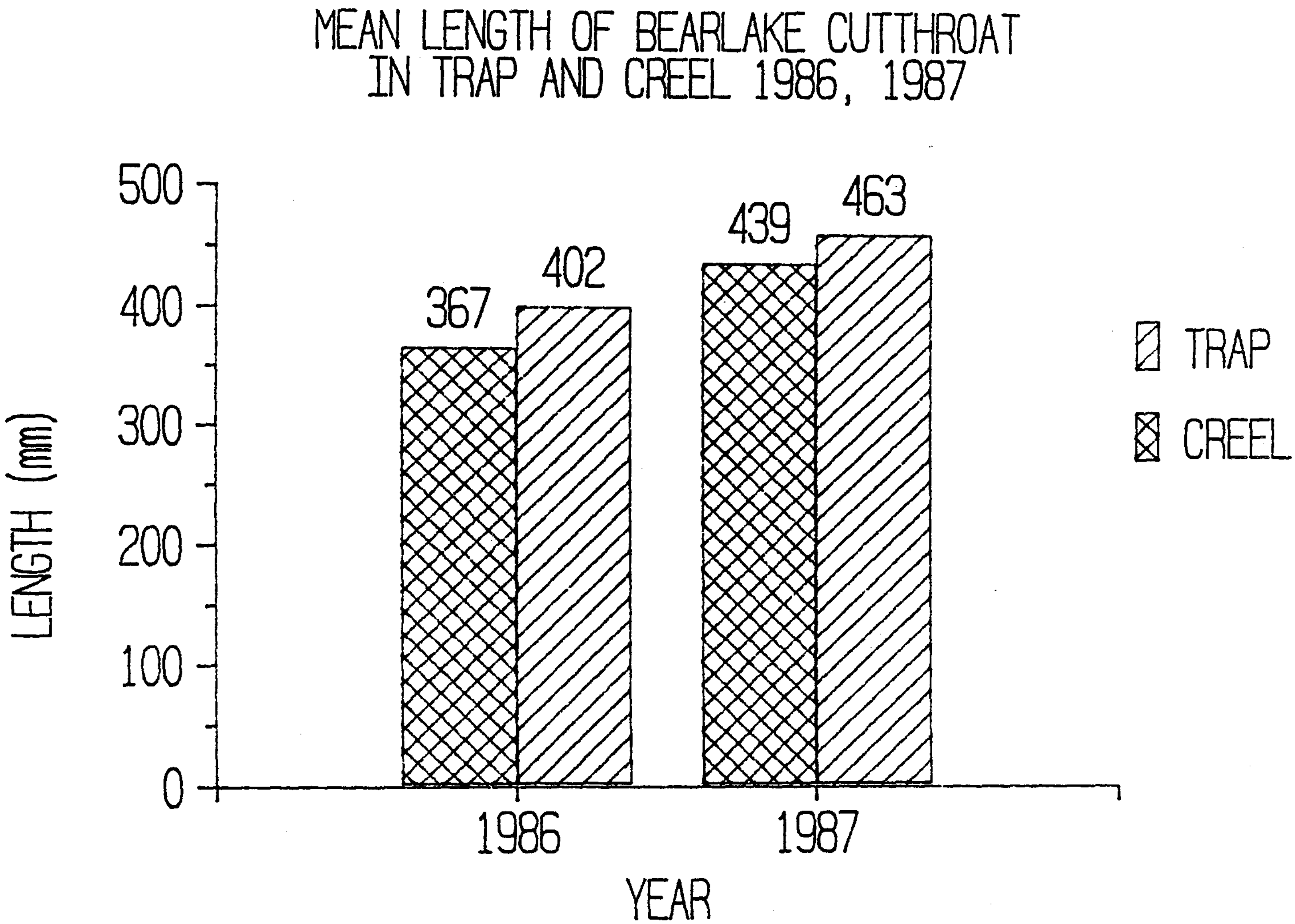

Figure 9. Mean lengths of Bear Lake cutthroat harvested by anglers in Blackfoot Reservoir and trapped from the Little Blackfoot River, 1986 and 1987.

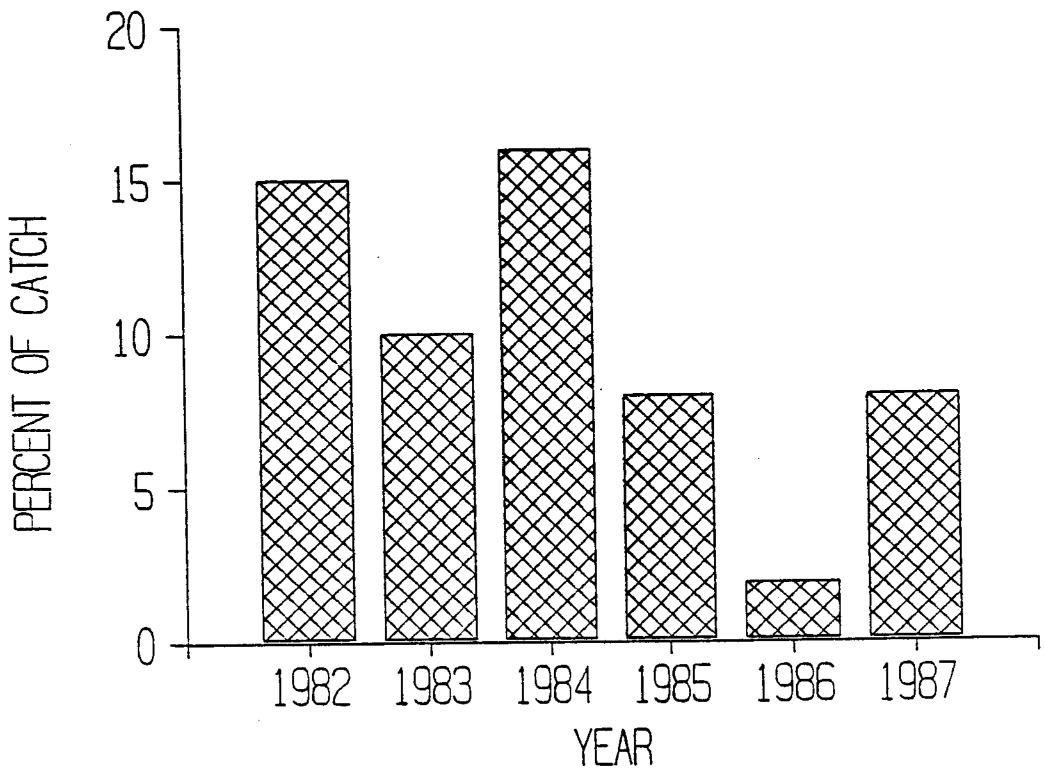

Figure 10. Percent wild cutthroat trout in the creel, Blackfoot Reservoir, June 1982-1987.

Table 7. Anglers interviewed, hours fished, fish harvested, and catch rates from various reservoirs in Region 5, 1987.

Reservoir and month	Numbers of anglers checked			Hours fished	Fish harvested							Fish per	
	Resident	Nonresident	Total		Hatchery rainbow	Wild rainbow	Wild cutthroat	Largemouth bass	Yellow perch	Bluegill	Total	Angler	Hr.
American Falls													
February	7	-	7	7	-	-	-	-	-	-	-	-	-
May	12	-	12	30	2	-	-	-	-	-	2	.17	.07
June	19	2	21	69	3	-	-	-	-	-	3	.14	.04
July	10	-	10	31	5	-	-	-	-	-	5	.50	.16
TOTAL	48	2	50	137	10	-	-	-	-	-	10	.20	.07
Deep Creek													
June	6	34	40	183	55	-	1	-	-	-	56	1.40	.31
Hawkins													
May	48	11	59	88	63	-	-	-	-	-	63	1.07	.72
June	47	14	61	100	50	-	-	-	-	-	50	.82	.50
August	9	-	9	19	7	-	-	-	-	-	7	.78	.37
TOTAL	104	25	129	207	120	-	-	-	-	-	120	.93	.58
Glendale													
May	13	15	28	59	22	-	-	8	-	-	30	1.07	.51
Johnson													
May	5	7	12	12	5	-	-	-	1	-	6	.50	.50
McTucker Ponds													
January	7	-	7	7	6	-	-	-	-	-	6	.86	.86
June	2	-	2	4	2	-	-	-	-	-	2	1.00	.50
TOTAL	9	-	9	11	8	-	-	-	-	-	8	.89	.73
Montpelier													
April	13	-	13	21	9	-	2	-	-	-	11	.85	.52
Oneida													
April	8	-	8	58	-	-	-	-	-	-	-	-	-
Pleasantview													
May	21	-	21	18	1	1	8	3	-	-	13	.62	.72
Rose Pond													
January	7	-	7	19	19	-	-	-	7	-	26	3.71	1.37
March	19	-	19	29	13	-	-	-	-	-	13	.68	.45
April	22	1	23	57	65	-	-	-	-	-	65	2.82	1.14
TOTAL	48	1	49	105	97	-	-	-	7	-	104	-	1.00

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Table 7. Continued.

Reservoir and month	Numbers of anglers checked			Hours fished	Fish harvested							Fish per	
	Resident	Nonresident	Total		Hatchery rainbow	Wild rainbow	Wild cutthroat	Large-mouth bass	Yellow perch	Blue-gill	Total	Angler	Hr.
St. John													
May	8	2	10	13	6	-	-	-	1	-	7	.70	.54
June	10	2	12	15	-	-	-	-	-	-	-	-	-
TOTAL	18	4	22	28	6	-	-	-	1	-	7	.32	.25
Springfield													
January	16	2	18	35	15	-	-	-	-	-	15	.83	.43
February	120	3	123	242	68	-	-	-	-	-	68	.55	.28
March	15	-	15	21	1	-	-	-	-	-	1	.07	.05
April	10	-	10	15	25	-	-	-	-	-	25	2.50	1.67
June	6	-	6	3	2	-	-	-	-	-	2	.33	.67
TOTAL	167	5	172	316	111	-	-	-	-	-	111	.65	.35
Treasureton													
February	8	-	8	35	39	-	-	-	-	-	39	4.89	1.11
May	35	6	41	112	25	-	-	-	-	1	26	.63	.23
June	4	2	6	9	2	-	-	-	-	-	2	.33	.22
July	9	-	9	27	9	-	-	-	-	1	10	.11	.04
TOTAL	56	8	64	183	75	-	-	-	-	2	77	1.20	.42
Twin Lakes													
May	43	44	87	257	74	-	-	4	-	63	141	1.62	.55
June	12	8	20	59	34	-	-	-	-	38	72	3.60	1.22
TOTAL	55	52	107	316	108	-	-	4	-	101	213	1.99	.67
Weston													
April	6	-	6	19	1	-	-	-	-		1	.17	.05
Windor													
May	20	6	26	64	36	-	-	5	-	7	48	1.85	.75
August	9	-	9	56	5	-	-	-	-	62	67	7.44	1.20
TOTAL	29	6	35	120	41	-	-	5	-	69	115	3.29	.96
Wiregrass													
May	7	1	8	16	18	-	-	-	-	-	18	2.25	1.13
June	13	1	14	54	25	-	-	-	-	-	25	1.79	.46
TOTAL	20	2	22	70	43	-	-	-	-	-	43	1.95	.61

Blackfoot Reservoir

The lack of age III trout (both males and females) in the 1987 spawning run suggests a weak year class in the reservoir and may result in lower returns to the weir in 1988. The reason for the lack of three-year-old spawners is unknown. The strong return of age III fish in 1986 was based on a plant of 4,236,000 age I fingerlings in 1984 (Figure 7). The number of fingerlings planted in 1985 declined by 42% but this drop in numbers planted does not explain their nearly complete absence in the 1987 run.

A number of factors may be responsible for the increased survival to eye-up obtained during the 1987 trapping operation. During 1987 Grace Hatchery personnel used a sperm diluent on all production fish in an effort to improve fertilization success. The same procedure is used by Utah DNR in the Bear Lake program. In addition, all production fish were spawned in water trucked from Grace Hatchery in order to prevent egg micropore blockage from sediment and detritus in the Little Blackfoot River. Another factor likely resulting in increased egg survival in 1987 may have simply been the increased age of fish in the run. Very few three-year-old Bear Lake cutthroat spawn but the eggs produced from these fish are of poor quality and most do not hatch (R. Jensen, Utah DNR, personal communication).

Although egg survival to eye-up in 1987 was nearly double that of the previous year, this rate (50%) is still well below levels obtained at Bear Lake and poor egg survival continues to hamper the Blackfoot program.

JOB PERFORMANCE REPORT

State of: Idaho Project **Name: REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS**

No.: F-71-R-12

Job No.: 5-c **Title: Region 5 Rivers and Streams Investigations**

Period Covered: 1 July 1987 thru 30 June 1988

ABSTRACT

A total of 36 cutthroat trout spawners (1.8/km) and 137 redds (5.3/km) were observed on annual counts on upper Blackfoot River tributaries. Redd densities varied substantially on individual tributaries but were 37% less numerous than in 1986. Mean spawner and redd densities calculated for six major tributaries combined have declined at statistically significant rates.

Midsummer angler effort on the upper Blackfoot River declined 25% from 1978 levels. Angler effort on Diamond Creek declined by 73Z. Harvest rates (trout/hr) also declined from .32 to .20 in 1978 and 1987, respectively. Opening day harvest rates have declined at a statistically significant rate since 1964.

Bonneville cutthroat trout densities inside a cattle exclosure on Preuss Creek were nearly double that observed immediately downstream. However, trout densities in both stations declined from previous years, apparently as a result of macrohabitat declines. Length frequencies of cutthroat in both stations were similar.

Fine-spotted cutthroat trout comprised nearly 100% of all gamefish captured in the Tincup and Jackknife drainages. The two major Tincup Creek spawning tributaries (Bear Canyon and South Fork Tincup creeks) have been impacted by sheep grazing. Nonetheless, a single station in Bear Creek contained the highest salmonid densities observed in the region during the past three years.

The wild salmonid population in St. Charles Creek is comprised of Bear Lake cutthroat, brook, and rainbow trout. Cutthroat/rainbow hybridization was apparent, particularly in a headwater station. Two irrigation diversions appear to result in major losses of both emigrating Bear Lake cutthroat and resident populations.

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OBJECTIVES

1. To estimate angler use and harvest on the upper Blackfoot River for comparison with similar information collected in 1978.

2. To monitor long-term population trends on upper Blackfoot River tributaries.

3. To evaluate the Caribou National Forest's habitat improvement program in Diamond Creek.

4. To evaluate the status of both fine-spotted cutthroat trout and brown trout populations in selected tributaries of the Salt River.

.5. To monitor rare Bonneville cutthroat populations in Giraffe, Preuss, and Dry creeks and evaluate the effects of cattle exclosures on stream habitat.

6. To assess both the status of the Bear Lake cutthroat trout population in St. Charles Creek and salmonid losses to irrigation diversions.

7. Monitor long-term population trends in a section of the Portneuf River upstream from Lava Hot Springs.

8. Estimate wild cutthroat trout abundance in South Fork Toponce Creek to aid in upcoming road access decisions.

RECOMMENDATIONS

1. Continue June spawning ground surveys on the upper Blackfoot River.
2. Conduct population sampling on' the upper Blackfoot River and tributaries for direct comparison with electrofishing results from the late 1970s.
3. Conduct a season-long creel census of the upper Blackfoot River fishery for comparison with results obtained in 1978.
4. Continue long-term monitoring of habitat improvement structures in Diamond Creek.
5. Continue long-term monitoring of Bonneville cutthroat populations in Preuss, Giraffe, and Dry creeks.
6. Establish additional sampling stations in Dry Creek.
7. Evaluate the success of hatchery fine-spotted cutthroat plants in terms of return to the creel and their genetic impacts on the wild population.

8. Estimate angler use and harvest on Tincup Creek in the near future.

9. Efforts should be made to work with the USFS on methods to avoid sheep and cattle concentrations in riparian zones of Bear Canyon, South Fork Tincup, and Jackknife creeks.

10. Conduct an evaluation of irrigation diversions within the St. Charles Creek drainage and assess their impact on both the resident fishery and outmigrating Bear Lake cutthroat trout.

11. Continue to work with other agencies on the development of programs to reduce silt concentration in the Upper Portneuf River which are impacting wild trout populations.

TECHNIQUES

Upper Blackfoot River

Spawning Ground Survey

Between 8-11 June, 1986, Caribou National Forest (CNF) and Department personnel visually assessed spawner use in portions of 11 tributaries of the upper Blackfoot River. The number of spawning sized fish and visible redds were counted by walking each stream segement. On Timber, Stewart Canyon, Browns Canyon, Bacon, Timothy, Sheep, Kendall, Spring, and Lower Diamond creeks, we surveyed segments similar to those counted annually since 1978 (Thurow 1981). Survey counts were also conducted on Lanes Creek at the forest boundary and on a small unnamed spring that merges with Diamond Creek about 400 m above the mouth of Yellow Jacket Creek. These two stream segments were counted for the first time last year. Results of 1987 work and past surveys were analyzed for trend using the Durbin-Watson statistic and linear regression techniques.

Creel Census

We conducted a creel census on the upper Blackfoot River and a single tributary, Diamond Creek, between 15 July and 11 August 1987. We divided the river above Blackfoot Reservoir into six segments (Figure 1) and for comparative purposes, used the same techniques described by Thurow (1981). Verbal descriptions of these segments are as follows:

Section 2 -- Highway 34 Bridge to Monsanto Haul Bridge,
Section 3 -- Monsanto Haul Bridge to Slug Creek Bridge,
Section 4 -- Slug Creek Bridge to Upper Allen Diversion,
Section 5 -- Upper Allen Diversion to Trail Guard Station, and
Section 6 -- Trail Guard Station to Diamond Creek.

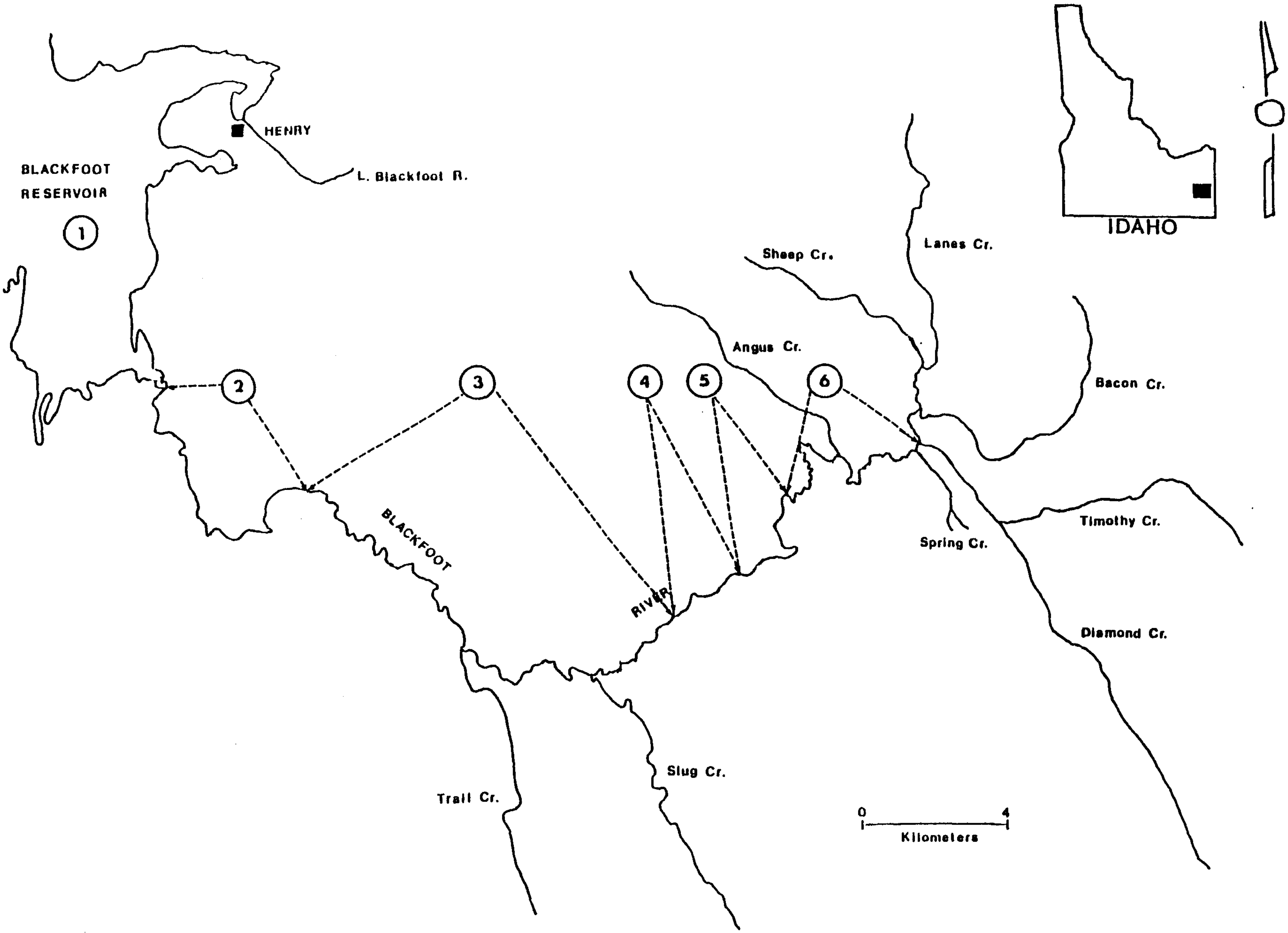

Figure 1. Location of creel census sections, upper Blackfoot River, 1987.

The census period was divided into two 14-day intervals. Two weekend and two weekdays were randomly selected from each interval as count days. Three angler counts, one in the morning, one at midday, and one in late afternoon, were made on each designated day. Actual count times within these periods were selected at random from four possible time periods.

To obtain estimates of angler use, we utilized both vehicle and angler counts. If an exact number of anglers could be associated with a specific vehicle, then the number of anglers was recorded. If anglers could not be observed and contacted directly, the vehicle was counted. During the entire census, questionnaires and pre-addressed envelopes were placed on those vehicles containing unknown numbers of anglers. A mean number of anglers/vehicle was derived for the season using both questionnaire results and personal angler contacts. In subsequent calculation, we used the mean anglers/vehicle value to convert vehicle counts into an estimate of angler numbers.

We estimated the total hours of angler effort for each stream section per interval using the following formula (Thurow 1980):

$\bar{x}$ WD(H) + X1 WE(H) Where:

WD = total number of weekdays per interval,
WE = total number of weekend days per interval,
(H) = means daylight hours per interval,

$\bar{x}$ - = mean number of anglers counted for all weekdays during an interval, and

$\bar{x}$ 1 - = mean number of anglers counted for all weekends during an interval.

Both $\bar{x}$1and $\bar{x}_1$ = $\frac{\text{total anglers counted per interval}}{\text{total number of counts per interval}}$

During angler counts, harvest information including fish lengths, weights, species harvested, and hours fished was collected from as many anglers as possible.

Opening Day Check Station

We operated a check station at the sucker trap access site to evaluate fishing success on the 1 July, season opening of the Blackfoot River and tributaries above the Highway 34 Bridge. This station has been operated annually since 1970. We interviewed all anglers past the station to obtain catch and harvest rates (fish/hour), catch per angler day, and total lengths of all trout caught. To facilitate comparisons with historical data, we separated the river into two sections, above and below the Slug Creek Bridge. We analyzed past opening day catch rates for trend using linear regression.

Habitat Improvement Evaluation - Diamond Creek

On 19 and 25 August, we electrofished four stations in Diamond Creek to continue our cooperative evaluation of the Caribou National Forest's habitat improvement program begun in 1984. Subalpine fir trees 4-5 m in length have been placed along about 1.7 km of streambank to narrow the channel and stabilize cutbanks caused from cattle grazing and high water events.

We used backpack electrofishing gear to conduct Seber 2-pass population estimates on three treated segments ranging from 83 to 165 m in length and on a single untreated control segment 88.4 m long. Two of these stations had been electrofished in prior years. We weighed and measured all fish collected and converted estimates to numbers/100 m^2 for comparative purposes.

Bonneville Cutthroat Assessment

We completed electrofishing inventories on Preuss and Giraffe creeks to continue long-term trend evaluation of their Bonneville cutthroat population. On both streams, we sampled stations located within an existing Caribou National Forest cattle exclosure and within another site immediately adjacent to the exclosure. The latter serves as a control site on both streams. The exclosure fences on Preuss and Giraffe creeks were constructed in 1979 and 1981, respectively. Population sampling has been conducted every fall since 1985. In 1987, two additional sampling stations were established, one on Preuss Creek and one in the Dry Creek drainage.

Portable backpack electrofishing gear was used to conduct 2-pass population estimates at all stations. Mean lengths and weights to the nearest mm and g, respectively, were taken from all fish collected.

Salt River Tributary Inventory

Fine-Spotted Cutthroat and Brown Trout Status

We conducted electrofishing inventories on Tincup, Jackknife, and Sage creeks, three major tributaries of the Salt River, to determine their importance as brown trout rearing streams and to assess the status of their fine-spotted cutthroat populations.

We selected 11 electrofishing stations within these 3 drainages (Table 1). Within the Jackknife Creek drainage, we sampled one station on Jackknife Creek itself and sites on two tributaries, Deep and Squaw creeks. We electrofished two stations in the Sage Creek drainage including Sage Creek and the Middle Fork of Sage Creek. The remaining six sampling stations were all located within the Tincup drainage.

Table 1. Electrofishing stations, Tincup, Jackknife, and Sage creeks, 1987.

Stream	Station name	Location	Mean width (m)	Length (m)	Area (m^2)
Tincup Creek	TCCK-1	Begins approximately 20 m above first highway bridge below Tincup Campground.	5.7	155	879
Tincup Creek	TCCK-2	Ends at 1st riffle below South Fork Tincup Creek Footbridge.	6.4	117	752
Tincup Creek	TCCK-3	Begins at Bridge Creek Road (upstream edge).	5.1	100	506
South Fork Tincup Cr.	SFKTK-1	Approximately 1/2 mile above confluence with Tincup Creek.	3.4	100	338
Corral Creek	CRCK-1	Approximately 1/2 mile upstream of mouth.	1.3	37	49
Bear Canyon Creek	BCCK-1	Begins at 1st culvert crossing on Creek (upper edge).	1.5	52	78.6
Jackknife Creek	JKCK-1	Approximately 1/4 mile above mouth of Cabin Creek.	4.9	107	524
Squaw Creek	SQCK-1	Approximately 200 m upstream from mouth at USFS GAWS Station.	2.2	84	185
Deep Creek	DPCK-1	Approximately 1/2 mile above forest boundary.	2.5	54	132
Sage Creek	SGCK-1	Begins at 1st riffle above Crow Creek Road (2 culverts).	4.9	215	1,060
Middle Fork Sage Cr.	MFKSK-1	Begins at fence behind old house and ends at culvert.	3.8	155	581

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All stations were sampled using generator-powered backpack gear. At three of the largest stations (TCCK-1, TCCK-2, and SCCK-1), we used two backpack units in tandem to adequately cover the stream channel and improve capture probabilities. On ten stations, we conducted Seber 2-pass population estimates using standard techniques (Seber and LeCren 1967). Only one pass was attempted on the Corral Creek Station. Total lengths (mm) were recorded from all fish collected and weights to the nearest gram were taken when time permitted.

All electrofishing stations were marked on topographical maps. Corresponding sketches depicting major landmarks were filed in the Regional Office. At least one boundary of all stations was staked using 1.2-m long conduit and approximate stake positions have been included on sketches to aid in future station location.

Brown Trout Spawning Evaluation

On 1 October, we visually assessed brown trout spawning activity on two segments of Sage Creek. These areas included the entire length of the Middle Fork of Sage Creek from its mouth to headwater springs (0.8 km) and a 1.7 km segment of Sage Creek from the Crow Creek Road Bridge to the Sage Creek Road Crossing. We counted the number of spawning sized fish and all visible redds within these two stream segments.

St. Charles Creek

St. Charles Creek is a second order tributary to Bear Lake originating in the Bear Lake Range and flowing eastward into Bear Lake. The majority of the stream and all tributaries lie within the Caribou National Forest. The lower portion (approximately 8 stream km) flows through private land. After reaching private property, much of St. Charles Creek is diverted for agricultural purposes. Major diversions include the north and south ditches and smaller unnamed diversions have arbitrarily been named ditches 1 and 2 (Figure 2). Stream flow is further reduced approximately 3 km from the lake outlet where a natural channel (Big Creek) branches and flows northeasterly into Dingle Marsh.

St. Charles Creek is the only tributary to Bear Lake that has historically maintained a viable population of naturally spawning Bear Lake cutthroat. We conducted an electrofishing inventory in the drainage to assess Bear Lake cutthroat status and to complete a preliminary survey of salmonid losses to irrigation diversions.

A total of eight sites were selected as sampling stations. Four stations were located on mainstream St. Charles Creek, three on diversion ditches, and a lone site was chosen on the primary tributary, North Fork St. Charles Creek. Physical dimensions of the stations varied considerably (Table 2).

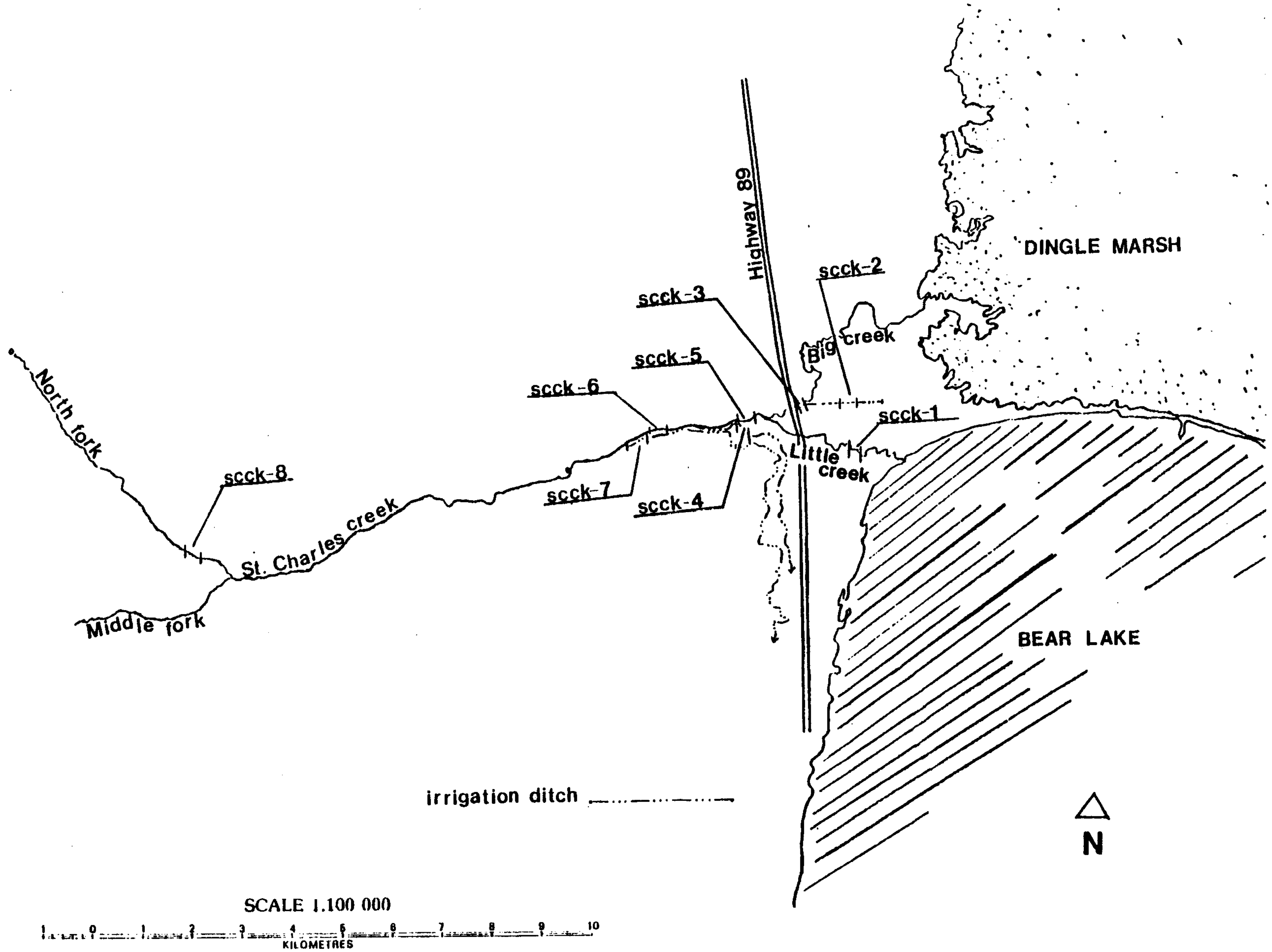

Figure 2. Location of electrofishing stations on St. Charles Creek, fall, 1987.

Table 2. Electrofishing stations, St. Charles Creek, September, 1987.

Stream or diversion	Station name	location	Mean width (m)	Length (m)	Area (m i
St. Charles Creek	SCCK-1	Begins 3 m above Transtrom weir site at riffle.	8.0	176	1,408
Ditch Number 1	SCCK-2	Ditch headgate lies approx. 200 m below Highway 89 Bridge on Big Creek Station. Begins at first dirt road crossing of•ditch below the Hwy. 89 Bridge.		50	
St. Charles Creek	SCCK-3	Station begins approx. 175 m below Hwy. 89 road crossing on Big Creek. Begins exactly 12 m above Ditch No. 1 headgate.	5.8	42	244
Ditch Number 2	SCCK-4	Station ends at first dirt road that crosses the ditch and St. Charles Creek above Hwy. 89 Bridge.	3.1	82	254
St. Charles Creek	SCCK-5	Begins approx. 150 m below first dirt road crossing above Hwy. 89 Bridge.	6	73	436
St. Charles Creek	SCCK-6	Station begins approx. 200 m below upper diversion headgate on slight bend near road. Begins in pool immed. above guardrails.	6.4	90	572
Ditch Number 3 (Upper diversion)	SCCK-7	Ends at upper diversion headgate.		50 (approx.)	
North Fork St. Charles Creek	SCCK-8	Begins approx. 15 m below first footbridge on North Fork Trail. Actually starts at horse ford.	4.6	76	348

Population estimates were conducted at six of these sites using backpack electrofishing gear and the 2-pass methodology (Seber and LeCren 1967). On two stations (SCCK-2 and SCCK-4), we made a single pass and a population estimate was not attempted.

In cooperation with Caribou National Forest personnel, we conducted General Aquatic Wildlife (GAWS) surveys (USFS, Region 4, 1985) on three stations in the drainage including SCCK-1, SCCK-3, and SCCK-8. Ratings for a number of individual GAWS parameters have been summarized in this report (streambottom, bank cover, bank stability, potential spawning area, and ungulate damage) along with an overall index of habitat condition (HCI).

Portneuf River

Population Monitoring

We conducted a Schnabel population estimate on the Upper Portneuf River using the same techniques as in the past (Reimer et al. 1987). In 1987 we made a population estimate for the upper river section only. This section is located from the Steel Bridge (Kelly Bridge) downstream to the Old Utah Bridge site, a distance of 3 km. The initial marking run was made on 1 September with subsequent recapture runs completed on 5 and 14 September, 1987.

South Fork Toponce Creek

Toponce Creek is the largest tributary to the Portneuf River above Lava Hot Springs. We conducted Seber 2-pass population estimates in two segments of the South Fork to facilitate future management decisions concerning road access and improvement. Sampling in one station, SFKTCK-1, was conducted in cooperation with Shoshone-Bannock Fisheries personnel.

Spot Creel Checks- Streams

We collected creel census information from popular streams in Region 5. Information was obtained with spot checks by virtually everyone in the Region. Unless specified otherwise, anglers were checked before they had completed fishing.

RESULTS

Upper Blackfoot River

Spawning Ground Survey

We surveyed a total of 25.4 stream kilometers on 11 tributaries between 8-11 June. A total of only 36 adult cutthroat spawners (1.8/km) were observed. Last year we observed a much higher density of spawners (4.5/km) while hiking identical segments on the same tributaries (Helmer et al. 1987). The sharp decline in spawners observed in 1987 appears to be the result of extremely low runoff which accelerated spawning activities in the drainage. Many postspawning cutthroat in upper valley tributaries had either died or moved downstream prior to our counts, in contrast to 1986 when most of the trout observed were actively spawning.

We observed a total of 137 redds (5.3/km) during the survey, or 37% less than in 1986. As in past years, spawner use on individual streams varied widely. Redd abundance (redds/km) ranged from 0 on Stewart Canyon Creek to 42 on an unnamed Diamond Creek Spring.

As can be noted in Appendix A, spawner surveys have been conducted on upper river tributaries since 1978 by both IDFG (1978, 1979, 1980, 1986) and Caribou National Forest personnel (1981-1986). Trend analysis is hindered somewhat by the lack of uniform count boundaries during the various years. For example, the length of stream surveyed on Spring Creek has varied from 1.5 to 5 km depending on water clarity conditions and available manpower.

An examination of survey results for six major streams combined indicates that 1982 spawner and redd counts were twice as great as results obtained in any other survey year (Table 3). The reason for these unusually high counts appears to be related to a change in personnel performing the counts. During 1982, new count personnel surveyed a total of only 5.7 km on the six streams summarized in Table 3. In typical years before and after 1982, count personnel surveyed approximately 18 km along these six streams. The 1982 count appeared to be limited only to those segments of the six streams known to sustain the greatest amount of spawner use. For this reason, we have discarded the 1982 counts in subsequent data analysis.

On eight individual tributaries, we analyzed past and present counts for trend using simple linear regression. Results of Durbin-Watson tests eliminated serial correlation as a consideration in all regression analysis. Given the nature of the data being analyzed, we selected a confidence level of 90X. Results of the various regressions are presented in Table 4.

Spring Creek was the only stream on which the regression of redds/km and year yielded a significant trend ($p=.01$). Declines in redd abundance on this stream during the past nine years has been severe (Figure 3).

Table 3. Mean number of spawners and redds per kilometer observed on Spring, Bacon, Sheep, Kendall, Timothy, and Browns Canyon creeks, 1978-1987.

Year	Mean spawners/km	Mean redds/km
1978	18.4	16.6
1979	5.6	-
1980	15.1	-
1981	-	-
1982	39.8	29.0
1983	12.0	13.2
1984	10.5	-
1985	-	-
1986	4.5	6.8
1987	1.8	5.3

Table 4. Summary of simple linear regression results for spawning ground counts on eight Blackfoot River tributaries.

	Range of years	Redds/km vs. year		Spawners/km vs. year		
Stream	tested	Regression results	Slope	Regression results	Slope	Comments
Spring Creek	1978-87	Sig (p=.01) F=6.953 (1,7)	-	Sig (p=.10) F=7.082 (1,7)	-	-
Timothy Creek	1978-87	NS[a]	-	NS	-	-
Bacon Creek	1978-87	NS	+	NS	-	Regression of redds/km vs. year yielded positive slope.
Brown Canyon Creek	1978-87	NS	+	NS	-	Regression of redds/km vs. year yielded positive slope.
Sheep Creek	1978-87	NS	-	Sig (p=.10) F=4.432 (1,7)	-	-
Kendall Creek	1978-87	NS	-	NS	-	-
Timber Creek	1981-87	NS	-	NS	-	-
Stewart Canyon Creek	1981-87	NS	-	NS	-	-

[a]NS indicates that significant trend in regression line did not exist (p=.10).

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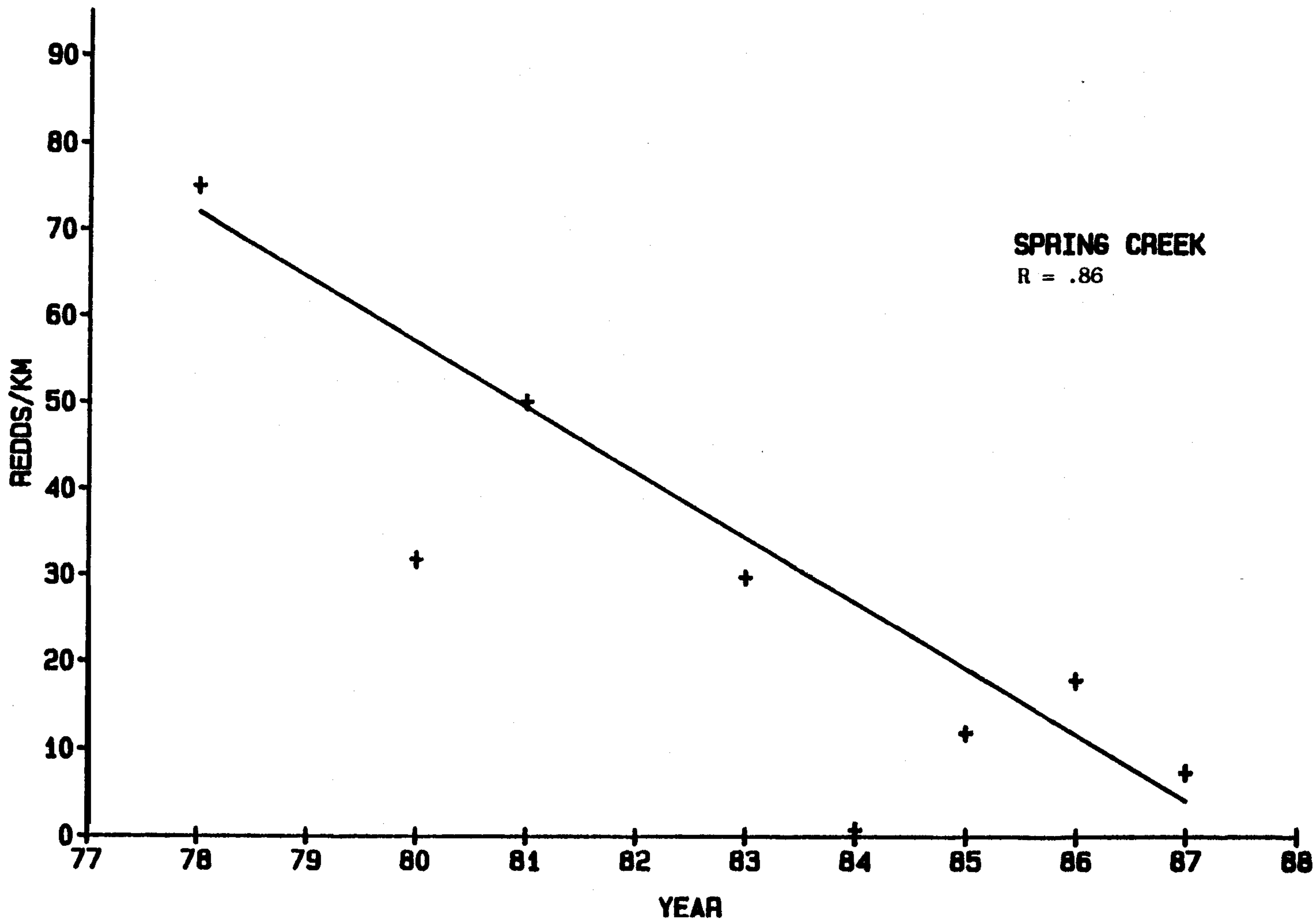

Figure 3. Regression analysis of results obtained during spawning ground surveys of Spring Creek, 1978-1988.

Actual spawner densities observed during counts declined at a statistically significant rate (p-.10) in only two streams (Spring and Sheep creeks). In both cases, declines were severe and the regression line was similar in appearance to results displayed in Figure 3.

In general, we were able to detect few statistically significant declines in either redd or spawner densities on the eight individual streams analyzed (3 of 16 regressions). However, the slope for all but two of 16 regressions was negative.

In reviewing the survey results for individual streams (Appendix A), it appears that a general decline in spawner use has occurred but the variable nature of the data has resulted in a poor relationship between the variables tested. A number of variables including water clarity, changes in observers, run timing, count boundaries, and actual escapement levels have undoubtably resulted in the high variance associated with these counts.

In an attempt to offset the masking affects of all but the latter variable, we also conducted regression analysis on a broader scale. We used the mean number of redds and spawners observed on six major spawning tributaries as y variables. These data are presented in Table 3. Again, we deleted 1982 count data for reasons described previously.

The regression of mean spawners/km vs. count year for all six streams combined was significant at the 95% confidence level (Figure 4). In addition, the regression of mean redds/km and count year was significant (p=.10) despite the low sample size (Figure 5). When analyzed on this broader scale, spawner use in upper valley tributaries appears to be declining at a statistically significant and alarming rate.

Creel Census

During the two intervals censused (7/15-8/6), angler effort on the entire upper river declined since 1978. Much of this drop occurred during Interval 2 when 39% less effort was expended on all study sections combined (Table 5). Total estimated effort expended during both intervals in 1987 was 2,174 hours, a 25% decline from 1978 levels.

Estimates of angler effort within individual river sections also varied substantially between the two study years. During 1978, an estimated 200 angler hours were expended in Section 4 (Slug Creek to the Upper Allen Diversion) during both intervals. In 1987, angler effort was virtually nonexistant at 37 hours during corresponding intervals. Effort on Diamond Creek also declined by 73%.

In contrast, effort on Section 5 (Upper Allen Diversion to Trail Guard Station) increased from 468 in 1978 to 678 hours during 1987. Angling on the Stocking Ranch (Section 6), which is by permission of the landowner only, also increased by 44%. Remaining river sections showed little change in effort between the two years.

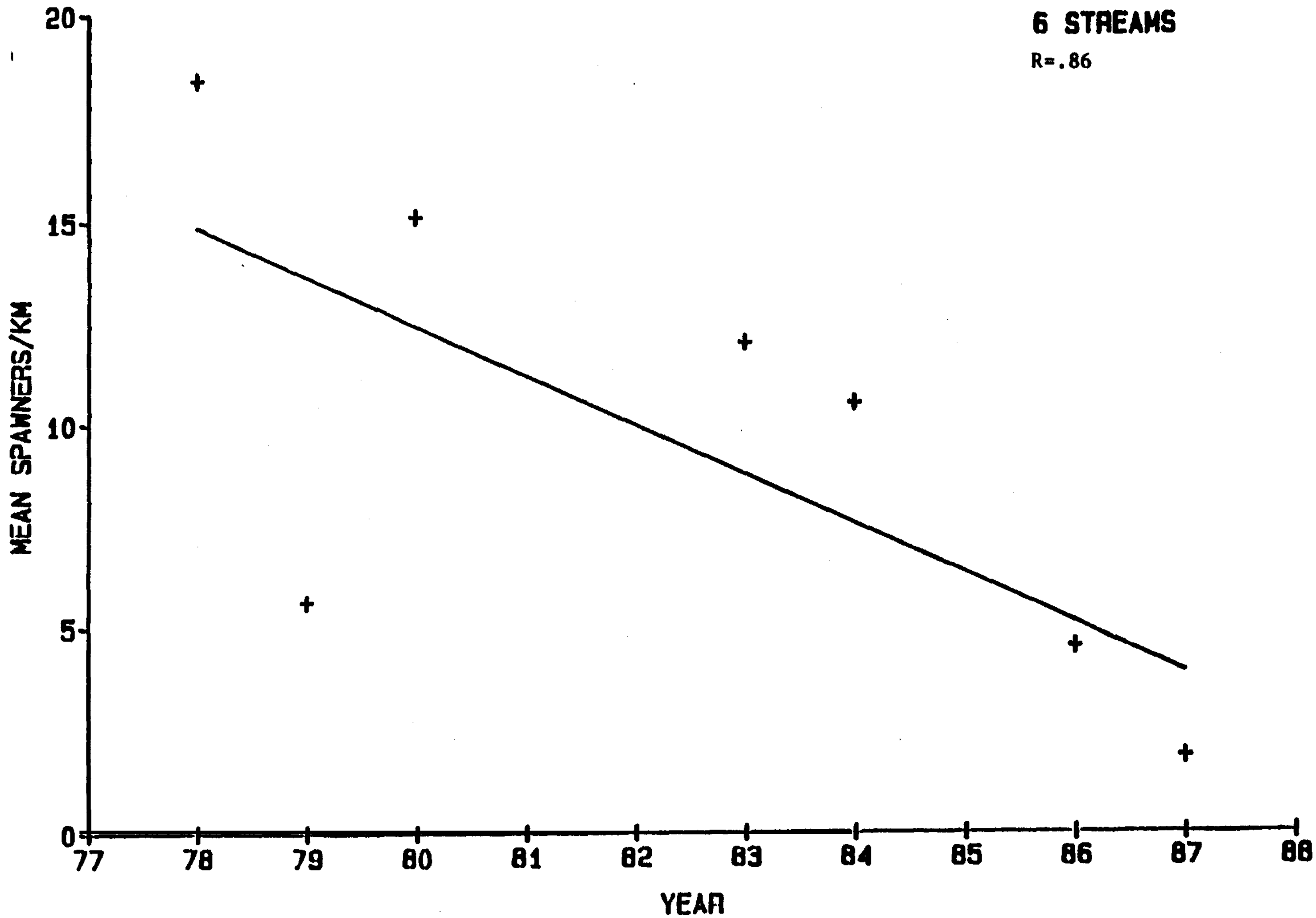

Figure 4. Regression analysis of mean cutthroat spawner numbers observed on six streams: Spring, Timothy, Bacon, Kendall, Browns Canyon, and Sheep creeks, 1978-1988.

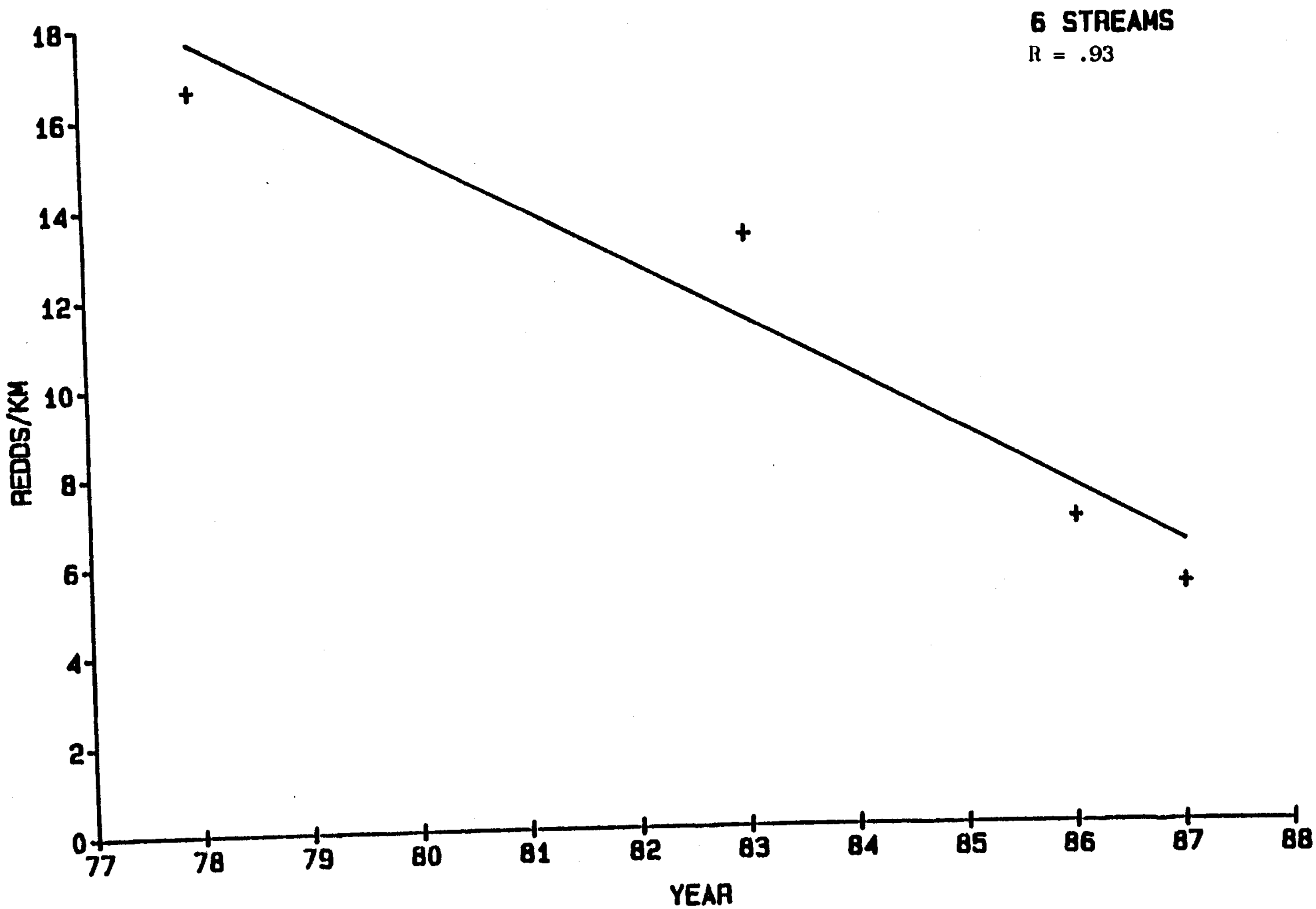

Figure 5. Regression analysis of mean cutthroat redds/km vs. year for six streams: Spring, Timothy, Bacon, Kendall, Browns Canyon, and Sheep creeks, 1978-1988.

Table 5. Estimated angler hours expended on upper Blackfoot River sections, 1978 and 1987.

River section	Interval 2[a]		Interval 2[b]		Intervals 2 & 3	
	1978 (7/10-7/23)	1987 (7/15-7/28)	1978 (7/24-8/6)	1987 (7/29-8/11)	1978 (7/10-8/6)	1987 (7/15-8/11)
2	241	424	337	43	578	467
3	502	333	200	339	702	672
4	333	37	367	0	700	37
5	272	324	196	354	468	678
6	37	214	116	17	153	231
Diamond Creek	250	54	80	35	330	89
Total (All Sections)	1,635	1,386	1,296	788	2,931	2,174

[a]Identified as Interval IV in Thurow 1980.
[b]Identified as Interval V in Thurow 1980.

Some of the above variation in angler effort may be explained by inherent error in creel census calculations, especially when utilizing car counts. In addition, a five-day discrepancy in interval starting dates exists between the two years because of changes in opening dates for a portion of the river. However, use declines of the magnitude presented for Section 4 and on Diamond Creek do appear to reflect substantial changes in angler effort.

The 1987 harvest rate for wild cutthroat caught during Interval 2 also appears to have declined from 1978 levels. The total harvest rate for the river including all sections dropped from .32 fish/hr in 1978 to .20 fish/hr in 1987 (Table 6). However, the number of anglers contacted in 1987 was too low for good statistical reliability.

Opening Day Check Station (July 1)

We interviewed a total of 206 anglers at the opening day check station after they had completed fishing. They had fished an estimated 973 hours while harvesting 188 cutthroat, 10 eastern brook, and 14 rainbow trout.

Two (1%) of the cutthroat were identified as Bear Lake cutthroat that had migrated upstream from Blackfoot Reservoir. One of these fish had negotiated the cascades in the lower narrows and was captured above the Slug Creek Bridge. The other was caught approximately 2 km from the reservoir. We observed 11 hatchery cutthroat strays in the opening day catch the previous year (Heimer et al. 1986). In addition, two (14%) of the rainbow trout harvested were of hatchery origin and had migrated from the reservoir.

The 1986 catch rate for the entire river, including both fish harvested and those released, was identical to last year's rate of .94 trout/hr. However, this success rate was well below that observed in 1985 (Table 7).

Although they captured trout at identical rates in 1986 and 1987, opening day anglers harvested less than 50% as many trout per hour during 1987 (.22 fish/hr). Anglers indicated that juvenile fish comprised an unusually high segment of their catch and they reportedly released more fish than in a typical year.

The high percentage of juveniles in the catch, as reported by anglers, may have been the result of unusually low water levels prior to opening day, which accelerated the spawning run in general and presumably encouraged a faster return of adults to the reservoir. In addition, June-July flows were at levels typical of late summer/fall and may have triggered early outmigration of juveniles from tributaries, thereby increasing their availability to anglers.

Historically that portion of the Blackfoot River above Slug Creek opened on 1 July and check station data applied only to that segment of the river above this point. However, the implementation of additional regulations on the river in 1985 closed the remainder of the river below

Table 6. Harvest rate for wild cutthroat trout in upper Blackfoot River sections, 1978 and 1987.

River section	Interval 2 1978 (7/10-7/23)	1987 (7/15-7/28)
2	.24	.14(28)[a]
3	.17	.61(23)
4	.49	.10(10)
5	.39	.07(14)
6	.32	.08(25)
$\bar{x}$ all sections:	.32	.20

[a]The number of angler hours used to derive 1987 catch rates is in parentheses.

Table 7. Summary results of opening day check stations on the upper Blackfoot River on 1 July, 1985-1987.

Year	Anglers checked	Hours fished	Cutthroat	Eastern brook	Rainbow	Total harvest	Fish per angler	Harvest per hour	Number trout released	Total catch per Angler	Total catch per Hour
1985	280	1,134	442	11	2	455	1.63	.40	1,078	5.48	1.35
1986	224	890	386[a]	11		405	1.81	.46	428	3.72	.94
1987	206	973	188[b]	10	14	212	1.03	.22	698	4.42	.94

[a]Eleven of these fish were classified as Bear Lake cutthroat.

[b]Two of these fish were classified as Bear Lake cutthroat.

Slug Creek Bridge to fishing until 1 July as well. Opening day check data collected the past two years applied to the entire river above Blackfoot Reservoir. This year, to facilitate more accurate comparisons with historical data, we divided anglers entering the station into two groups, those fishing above and below the Slug Creek Bridge.

The 1986 harvest rate for anglers above the bridge (.19 fish/hr) was the lowest recorded since the station began operation in 1964. Harvest rates have declined steadily from levels in excess of 1.0 fish/hr in the mid-sixties and early seventies (Table 8). Linear regression of the variables year and harvest/hr resulted in a highly significant trend (p-.01) since 1964 (Figure 6).

Anglers fishing that portion of the river below Slug Creek Bridge experienced slightly better success than those fishing above. Lower River anglers captured trout at a rate of 1.11 per hour and harvested .26 per hour.

Despite the declining harvest rates on the river above Slug Creek Bridge, as demonstrated in Figure 5, mean lengths of cutthroat harvested on opening day has shown little change since 1972 (Figure 7). Cutthroat trout caught by anglers throughout the drainage averaged 331 mm, a figure well within the range observed during the past 15 years.

Cutthroat trout harvested below Slug Creek Bridge averaged 322 mm. Length frequency analysis revealed no obvious differences in the size of fish harvested above and below the bridge in 1987 (Figure 8).

Even though anglers reported releasing large numbers of small cutthroat trout on 1 July 1987, juvenile fish still comprised a major portion of the harvest. Forty-nine percent of the opening day harvest consisted of fish 300 mm or less in total length (Figure 9). Based on age growth analyses conducted by Thurow (1980), these fish were primarily ages II-III fish destined for Blackfoot Reservoir.

Habitat Improvement - Diamond Creek

Cutthroat trout were the most common trout sampled in Diamond Creek, comprising 82-99% of all gamefish captured at the four individual stations. Eastern brook trout were the only other gamefish collected.

The density of 90 mm+ trout in the two lower stations (DMCK-1 and DMCK-2) was identical at 5 fish/100 m^2, respectively. DMCK-1 was treated with log-revetment structures during the previous month while DMCK-2 was established as an untreated control in 1986. As such, the similarity of trout densities between these two stations was expected. The 1987 density in DMCK-2 was also very similar to that observed during August of the previous year when we estimated 6 fish/100 m^2 were present (Heimer et al. 1987).

Trout densities in the two upper stations (DMCK-3 and DMCK-4) were over four times as great as those observed in the lower sites at 22 fish/100 m^2 (Table 9). This density is also over 20% higher than the 18 fish/100 m^2 we observed in DMCK-4 in August 1986 (Heimer et al. 1987).

Table 8. Summary results of opening day check stations on the Blackfoot River above Slug Creek Bridge, 1 July, 1964-1987.

			Fish harvested							Total catch per	
Year	Anglers checked	Hours fished	Cutthroat	Eastern brook	Rainbow	Total harvest	Fish per angler	Harvest per hour	Number trout released	Angler	Hour
1964	222	829	938	-	55	993	4.47	1.20	-	-	-
1965	107	436	591	6	16	613	5.73	1.41	-	-	-
1972	415	1,361	1,498	9	-	1,507	3.63	1.11	-	-	-
1973	316	864	885	83	-	968	3.06	1.12	-	-	-
1974	415	1,323	1,064	68	-	1,132	2.73	.86	-	-	-
1975	566	1,777	843	42	-	885	1.56	.50	-	-	-
1976	331	1,345	1,068	41	-	1,109	3.35	.83	-	-	-
1977	232	575	470	43	-	513	2.21	.89	-	-	-
1978	385	1,276	743	40	-	783	2.03	.61	-	-	-
1979	417	1,453	746	153	-	899	2.16	.62	-	-	-
1980	380	1,455	645	87	-	732	1.93	.50	-	-	-
1981	206	791	397	69	-	466	2.26	.59	821	6.25	1.63
1982	172	577	220	26	-	246	1.43	.43	234	2.79	.83
1983	149	542	226	13	-	239	1.60	.44	212	3.02	.83
1984	280	1,180	328	64	-	392	1.40	.33	290	2.44	.58
1987	107	530	84	9	6	99	.93	.19	319	3.91	.79

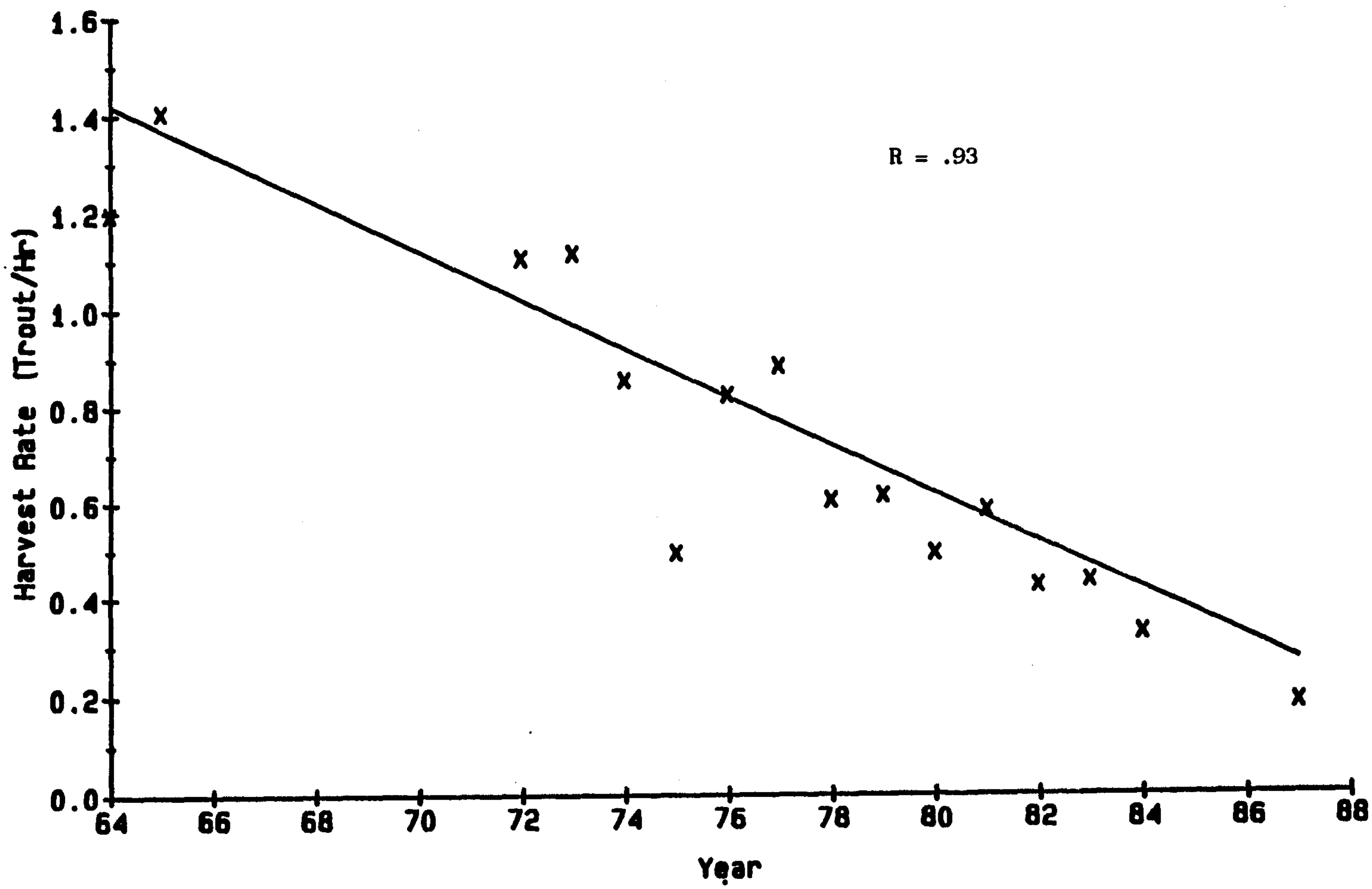

Figure 6. Regression of harvest rate (trout/hr) vs. year for opening day anglers fishing the upper Blackfoot River above Slug Creek Bridge, 1964-1988.

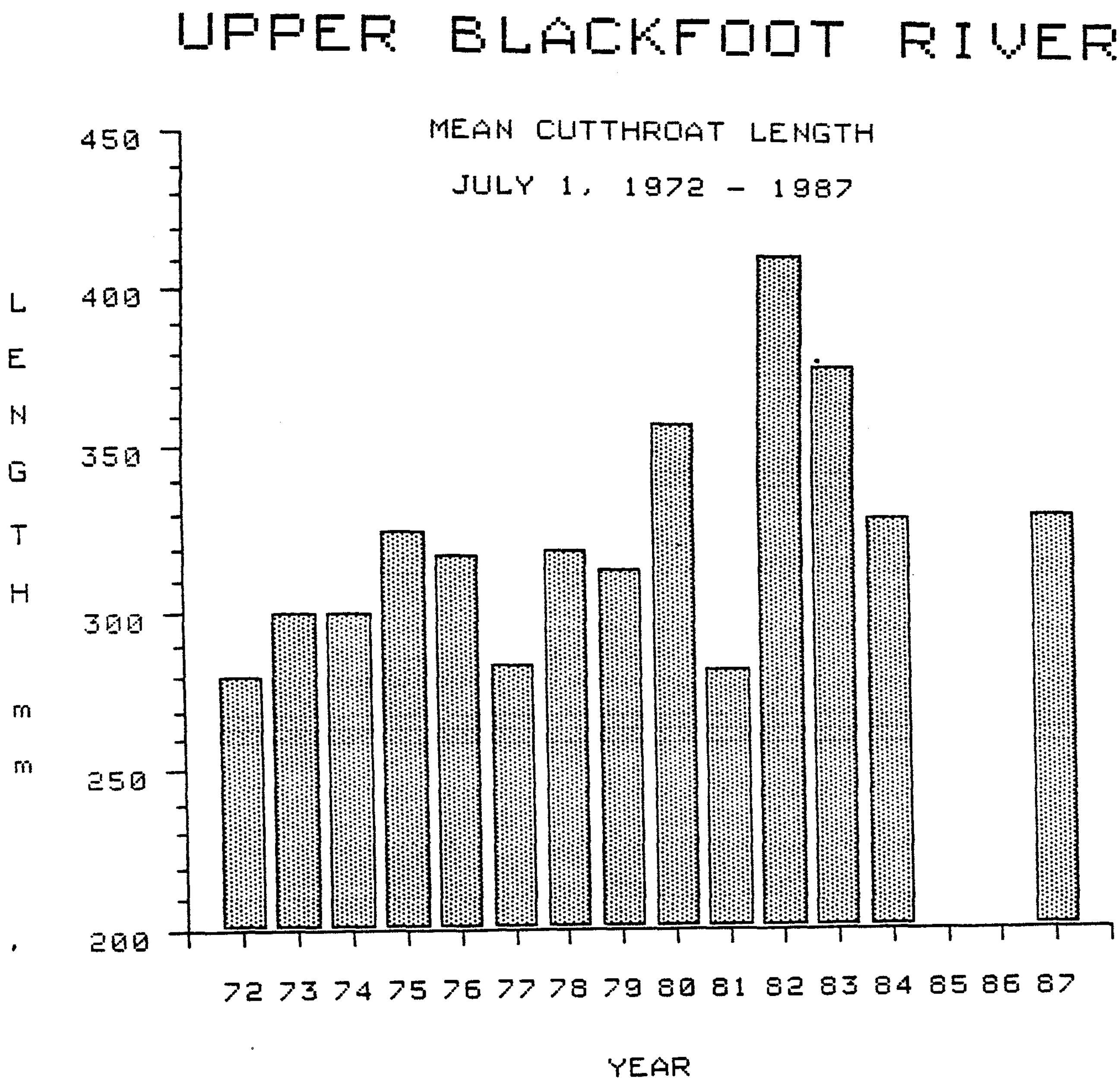

Figure 7. Mean lengths of wild cutthroat trout caught in the Blackfoot River above Slug Creek Bridge on opening day, 1972-1987.

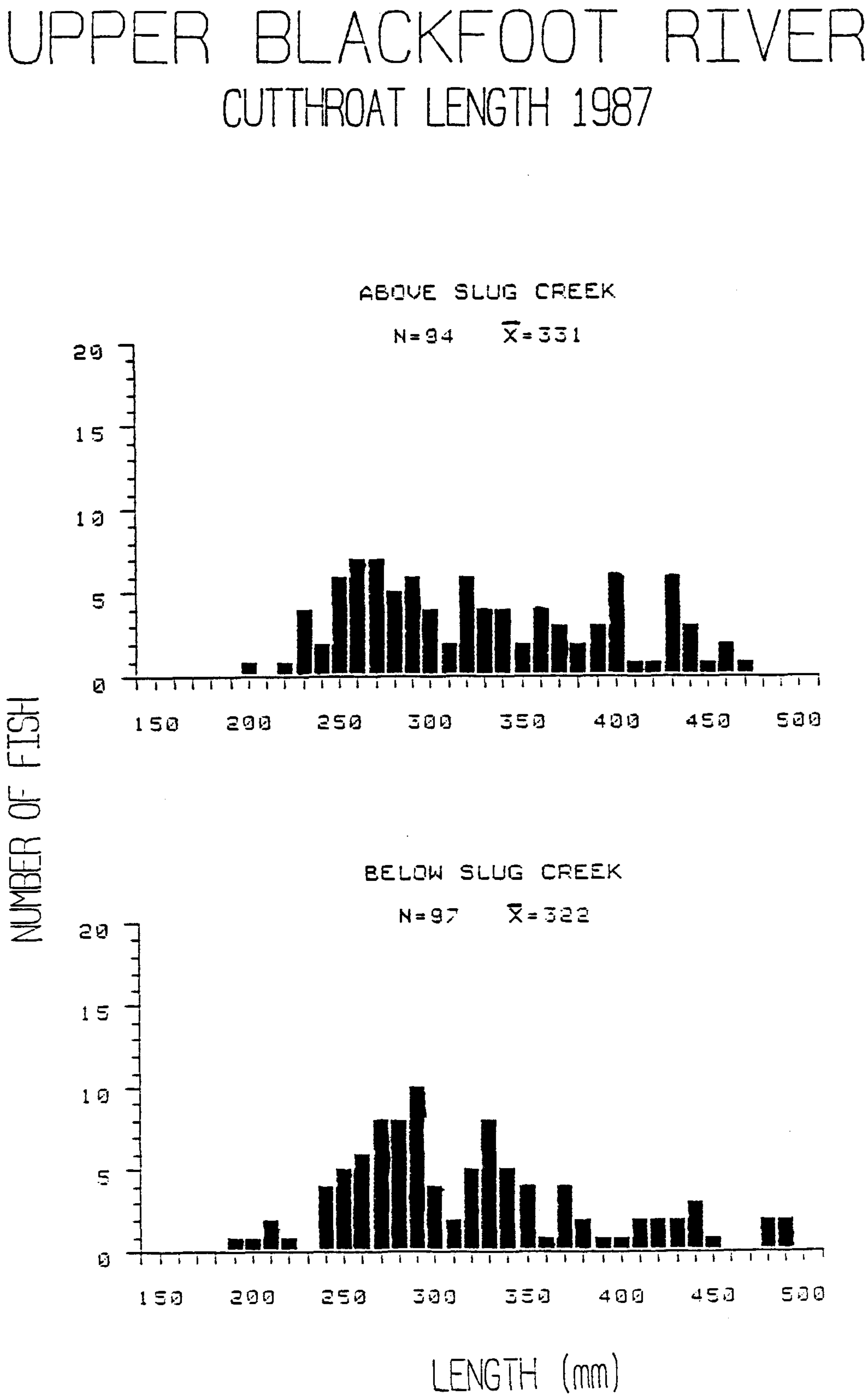

Figure 8. Length frequency of wild cutthroat trout caught above and below the Slug Creek Bridge on opening day, Blackfoot River, 1987.

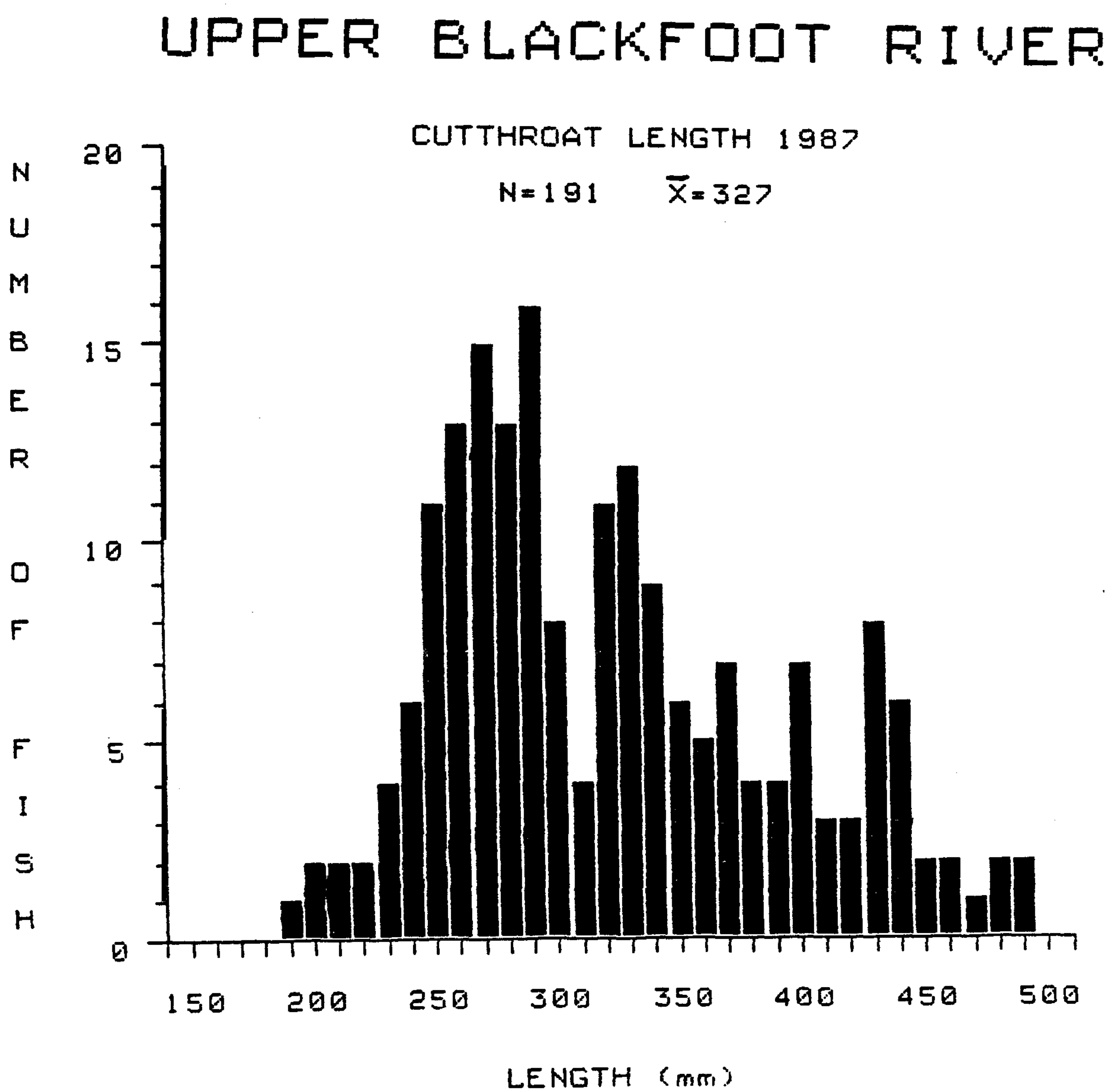

Figure 9. Length frequency of wild cutthroat trout caught by opening day anglers on the upper Blackfoot River, 1 July, 1987.

Table 9. Population estimates of trout 90 mm and larger for stations on Diamond Creek, August, 1987.

Station	Status	Length (m)	Area (m^2)	Population estimate	95% C. I.	Fish/ 100 m	Fish/ 100 m^2
DMCK-1	1987 treatment area	165	1,264	61	51-70	37	5
DMCK-2	Control area	87	324	16	6-26	18	5
DMCK-3	1985 treatment area - Stewart Flat	75	229	50	47-54	67	22
DMCK-4	1984 treatment area	83	228	51	49-53	61	22

The 20% increase in trout densities in DMCK-4 over a one-year period may reflect a response of Diamond Creek fish to improving habitat conditions within the stream. However, the low water year and virtual dewatering of upstream segments of Diamond Creek and its tributaries may also partly explain the increase.

As previous investigators (Platts 1976; Thurow 1981) have noted, Diamond Creek contains few resident adult cutthroat and serves primarily as a rearing area for juvenile fish (Figure 10). Less than 3% of the cutthroat trout population exceeded 200 mm in length at all four stations. The mean total length of cutthroat trout sampled at the four stations ranged from 106-114 mm (Table 10).

In general, brook trout sampled were larger in size than cutthroat trout. Mean total length of all brook trout sampled in the four stations ranged from 117 to 188 mm.

Population trend monitoring should continue on these stations to evaluate anticipated long-term benefits such as bank stabilization, increases in overhanging vegetation, undercut banks, etc. We also recommend that the revetments in DMCK-3 be removed during the upcoming field season. This station was originally reserved as a control for DMCK-4 but was unknowingly treated by Forest Service personnel in 1986. This action would establish two controls in close proximity to two treated stations and as such would provide for a better long-term evaluation of the revetment program.

Bonneville Cutthroat Assessment

Preuss Creek

All trout sampled in the three stations exhibited the spotting pattern and rosy coloration typical of Bonneville cutthroat trout. Densities of 90 mm + cutthroat trout were greatest in PCK-1 at 2 fish/100 m^2 (Table 11). This reach of stream was heavily damaged by livestock and received the poorest GAWS HCI rating of all three Preuss Creek stations (Burton 1987). Pools within Station 1 were of higher quality than those present in the upstream stations and presumably accounted for the higher densities. A higher percentage of fish in Station 1 also exceeded 200 mm in length than in upstream stations (Figure 11), again due to better pool quality. Virtually no fish less than 110 mm were sampled at this site.

This was the third consecutive year that full population densities have been estimated for PCK-2 and PCK-3. This year the number of trout within the exclosure was 62% greater than that found in the grazed station located immediately downstream. This is in contrast with 1986 results when densities in the two stations were nearly identical at 18 and 19 fish/100 m^2 (Heimer et al. 1987).

The length frequencies of cutthroat trout sampled at both stations were similar. The mean length of trout captured within and below the exclosure was 152 and 126 mm, respectively. Accurate estimates of

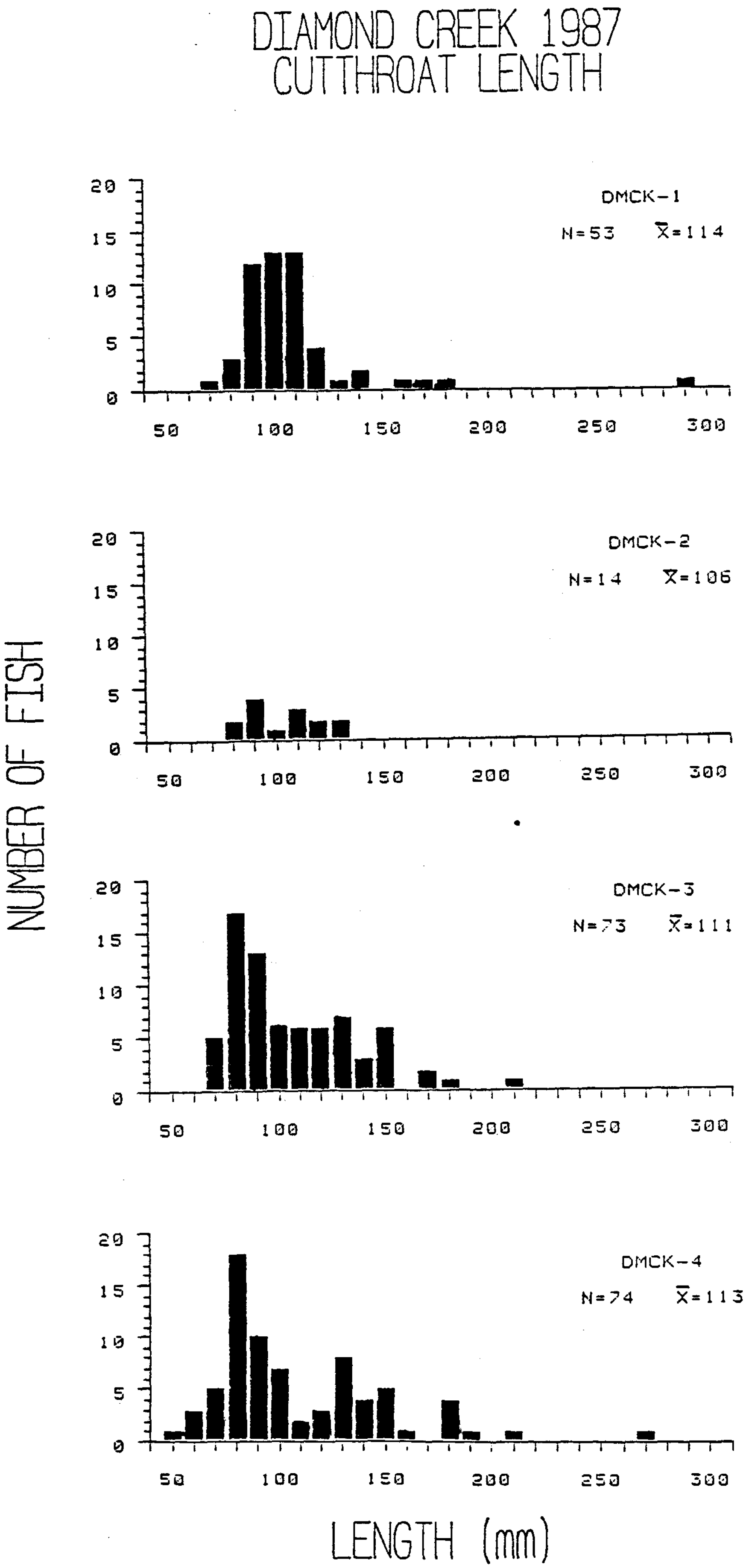

Figure 10. Length distributions of cutthroat trout sampled by electrofishing in four Diamond Creek stations, August, 1987.

Table 10. Salmonids collected by electrofishing, Diamond Creek stations, August, 1987.

Station	Date	Species	Number of fish	Percent of sample	Range length (mm)	Mean length (mm)	Percent larger than 200 mm
DMCK-1	8-25	CT[a]	53	85	72-292	114	2
		EBT[b]	9	15	90-116	117	11
DMCK-2	8-25	CT	14	82	80-131	106	0
		EBT	3	18	86-218	136	33
DMCK-3	8-19	CT	73	99	71-210	111	1
		EBT	1	1		188	0
DMCK-4	8-19	CT	74	93	54-274	113	3
		EBT	6	7	55-193	154	0

[a]Cutthroat trout.
[b]Brook trout.

Table 11. Results of electrofishing surveys conducted on three Idaho streams containing Bonneville cutthroat trout, fall, 1987.

Stream	Name & location	Date	Transect length (m)	Area (m^2)	Population estimate	95% confidence intervals	Fish/ 100	Fish/ 100 m^2	Mean trout length (mm)	Mean trout weight (g)
Preuss Creek	PCK-1 150 m above forest boundary	10/7	108	89	19	18-21	18	21	172	43
Preuss Creek	PCK-2 immediately below exclosure	10/7	142	293	22	21-23	15	8	126	23
Preuss Creek	PCK-3 exclosure	8/27	130	261	34	34-34	26	13	152	34
Giraffe Creek	GCK-1 immediately above exclosure	10/8	132	279	91	71-111	69	33	166	47
Giraffe Creek	GCK-2 exclosure	10/8	155	250	104	92-116	67	42	158	56
Dry Creek	DCK-1	8/21	91	210	29	24-35	32	14	109	-

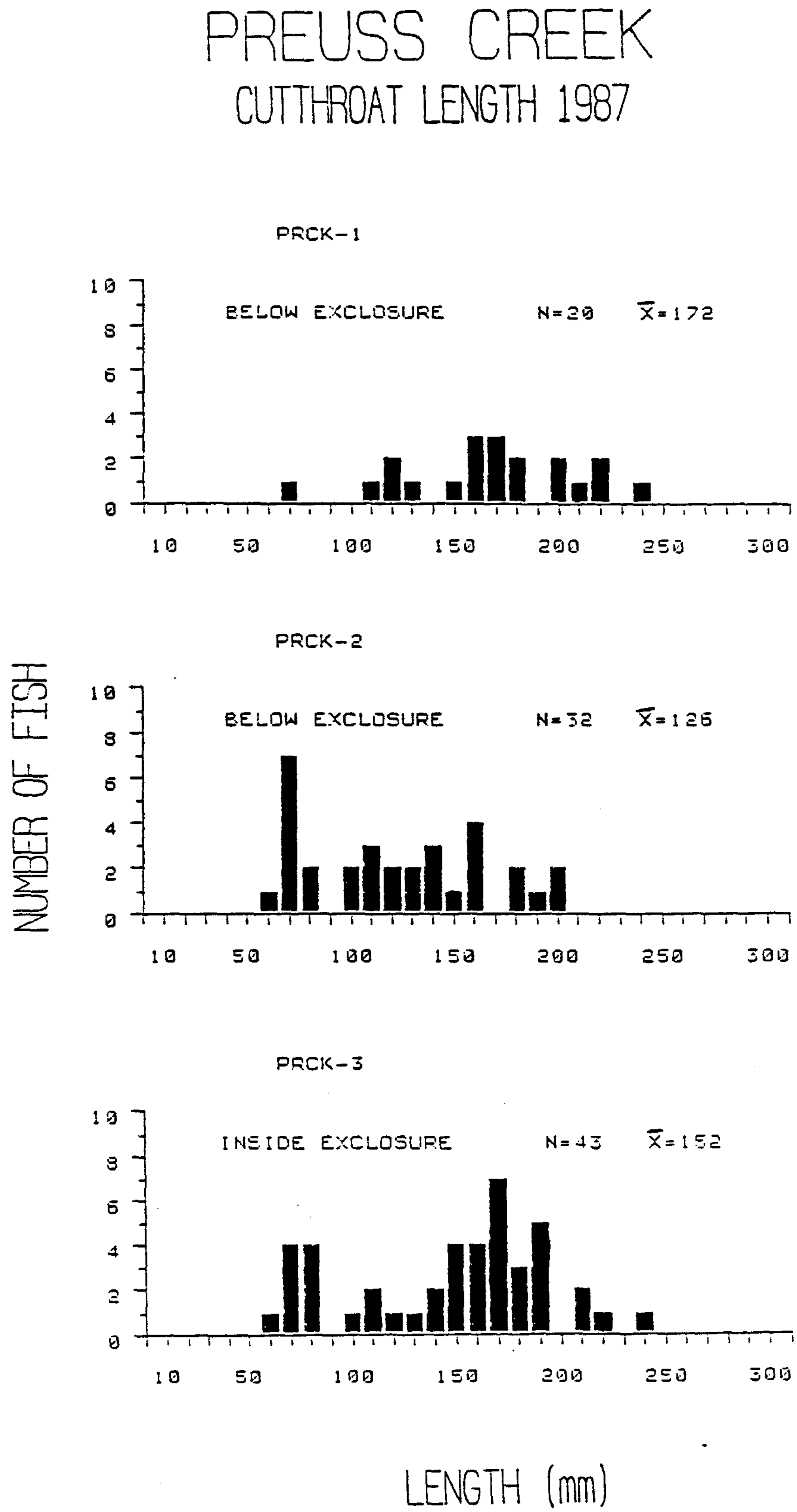

Figure 11. Length frequency distributions of Bonneville cutthroat trout electrofished from three Preuss Creek stations, October, 1987.

population densities for the two sites are unavailable for 1981, the year the exclosure was constructed. However, in general there has been a downward trend in population densities at both sites since electrofishing began in 1985 (Figure 12). Burton (1987) attributed these declines to macrohabitat variables and singled out increasing sediment loads from unstable streambanks as the most likely limiting factor. Burton also noted a general decline in riparian condition throughout the majority of the stream based on the R2 riparian scorecard method. In addition, stream channel stability as derived using the Ri methodology did improve somewhat since 1979 in several stream reaches above the exclosure but declined in all reaches located downstream.

In general, areas exhibiting declines in both riparian condition and channel stability are those associated with heavy livestock concentrations. These observations, along with the previously mentioned declines in abundance estimates, warrant a major change in grazing management in Preuss Creek to improve its poor trout habitat.

Giraffe Creek

Bonneville cutthroat numbers (90 mm+) in both Giraffe Creek stations were well above those observed the previous fall. We estimated that 42 and 33 fish/100 m^2 were present within and immediately above the exclosure, respectively, during 1987. These estimates were about twice those obtained in 1986 at 19 and 18 fish/100 m^2 (Heimer et al. 1987). The reason for the increase is unknown but may be related to beaver emigration from upstream dams in 1987 and subsequent declines in water levels.

Length frequency distributions of trout sampled in both grazed and ungrazed stations yielded similar results along with mean lengths of 166 and 158 mm, respectively (Figure 13). During the previous fall, trout sampled within both stations collectively averaged 188 mm.

Habitat within the exclosure was in excellent condition including extensive undercut banks and overhanging vegetation. Although riparian forage use in the grazed station was extensive, the overall habitat condition was similar to that observed within the exclosure. There appeared to be some removal of overhanging vegetation but undercut banks were still intact along with a narrow stream channel. Habitat condition as monitored by USFS personnel using GAWS methodology has showed no change either within or outside the exclosure since 1981 (Burton 1987).

The maintenance of high quality trout habitat in the grazed station may be due partly to steep streambanks and good water depth (1 m - 1.5 m) associated with beaver activity. Both the exclosure and grazing stations lie within a beaver dam and the narrow stream channel (1 m) and water depth may **discourage** cattle from frequent stream crossing.

In general, grazing large entrenched meadows (Rosgen 1985) in Giraffe Creek at present levels does not appear to be seriously impacting trout habitat. However, steeper gradient segments upstream flow through narrower valley bottoms and appear to be more susceptible to grazing impacts. The effects of grazing in these areas needs further evaluation.

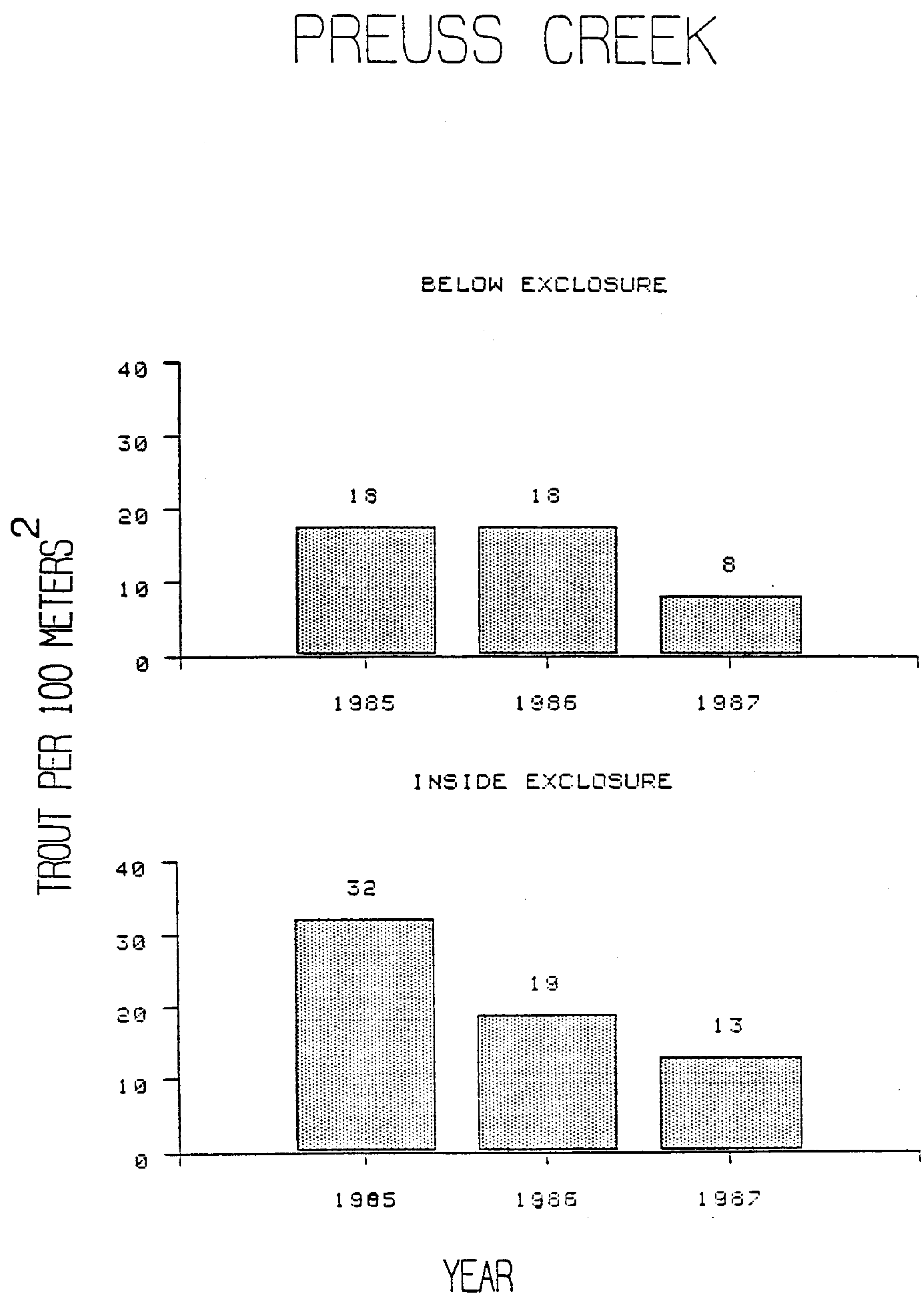

Figure 12. Estimated Bonneville cutthroat trout densities (fish/100 m^2) in grazed and ungrazed segments of Preuss Creek, October, 1985-1987.

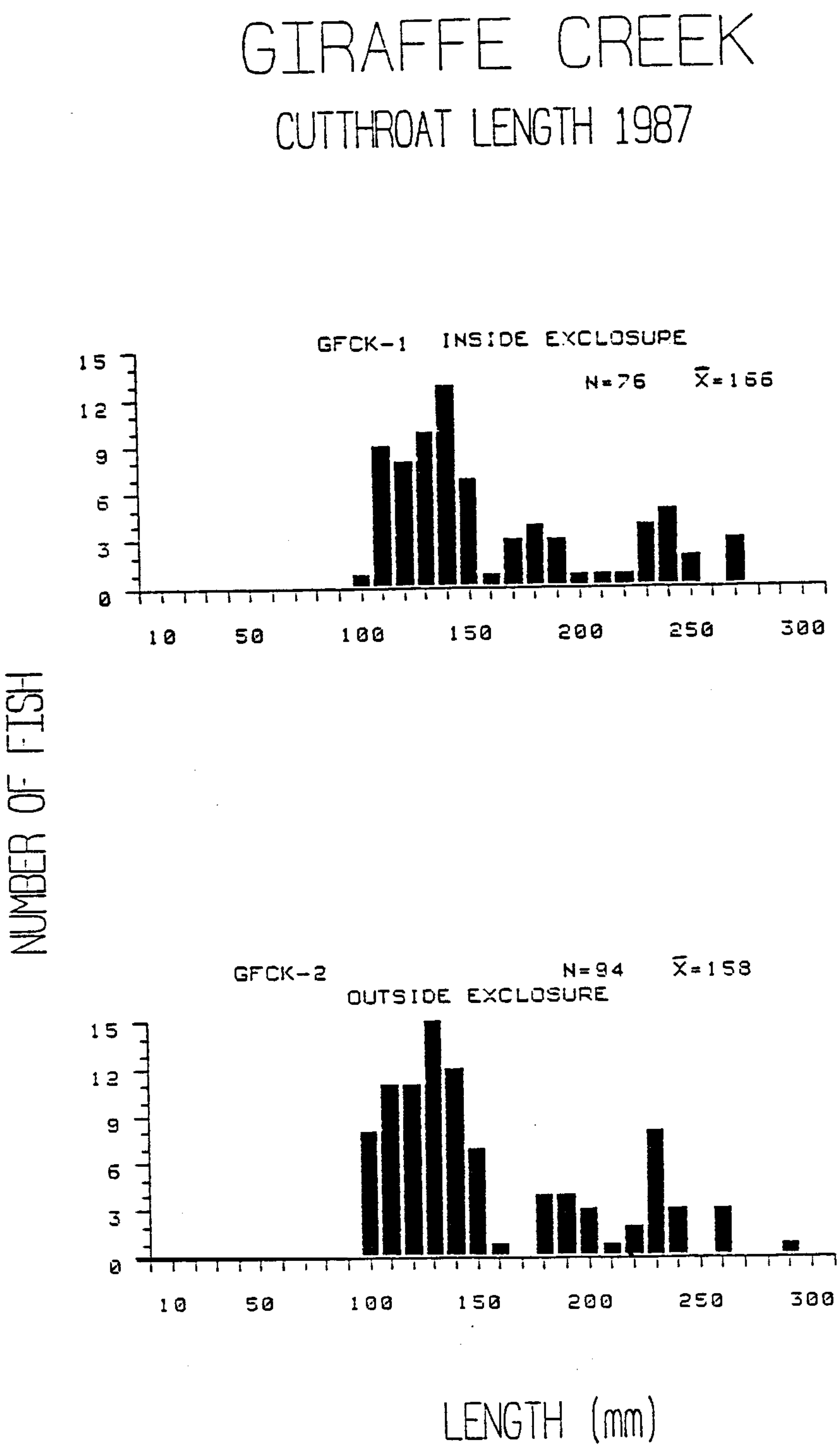

Figure 13. Length frequency distributions of Bonneville cutthroat trout electrofished from two Giraffe Creek stations, October, 1987.

Dry Creek

This was the first year that grazing has been permitted on lower segments of Dry Creek. We selected one station to monitor potential changes in Bonneville cutthroat trout abundance following intensive grazing. We estimated a total of 29 (90 mm+) cutthroat trout were present in the 91 m long station, or 14 fish/100 m^2. Much of the stream above and below this station was impounded by large beaver dams and appeared to contain substantially more trout. Cutthroat trout sampled during electrofishing ranged in length from 60 to 236 mm and averaged 109 mm in total length.

Habitat within the study site was in good condition but lack of good pool structure is probably a limiting factor. Bank trampling and associated damage were evident after a single grazing season.

Much of Dry Creek in its upper reaches has been heavily impacted by cattle. Burton (1987) reported that riparian conditions are declining in the upper 2-3 miles of this stream, and noted heavy livestock utilization. Channel stability ratings (R1 method) also indicated that channel condition is declining in upper reaches since ratings were conducted in 1979 (Tim Burton, USFS, personal communication). Burton attributed this to livestock concentration in the riparian zone.

Additional work is needed to evaluate Bonneville cutthroat populations in upper Dry Creek and to monitor the lower station for trend. A change in grazing strategy may be necessary to allow recovery in upper reaches.

Salt River Tributary Inventory

Tincup Creek

As expected fine-spotted cutthroat trout comprised nearly 100% of all gamefish captured in the drainage. We estimated densities of 90 mm+ trout in the three mainstream Tincup stations (TCCK-1, TCCK-2, and TCCK-3) at 13, 25, and 14 fish/100 m^2, respectively (Table 12).

Habitat within the lowermost station (TCCK-l) can be characterized as primarily runs with a few shallow pools. Some instream woody debris was present but, in general, overhead cover was limited. Cutthroat trout sampled averaged 123 mm and ranged from 52-296 mm in total length. Only 8% of these fish exceeded 200 mm in length. The only other salmonid captured in TCCK-1 was a ripe male brown trout 510 mm in length. Whether this trout was a resident or migratory fish is unknown. Heimer et al. (1987) reported substantial numbers of brown trout spawners in Stump and Crow creeks that had apparently migrated from the Salt River in Wyoming.

Trout habitat in TCCK-2 was superior to that in TCCK-1 and TCCK-3 primarily due to the presence of several deep pools. Trout densities in TCCK-2 (25 fish/100 m^4) were nearly twice those estimated for the other

Table 12. Population estimates of 90 mm+ trout for electrofishing stations in the Tincup and Jackknife Creek and Crow Creek drainages, September-October, 1987.

Stream name	Station name	90 mm+ C_1	Trout collected C_2	Population estimate	Conf. limit (.05	Fish per 100 m	Fish per 100 m²	Species composition
Tincup Creek	TCCK-1	69	27	113	93-134	73	13	99 CT 1 BRN
Tincup Creek	TCCK-2	134	37	185	172-199	158	25	98 CT 2 BRN <1 RB/CT
Tincup Creek	TCCK-3	58	9	69	65-72	69	14	100 CT
Jackknife Creek	JKCK-1	31	3	34	33-36	32	6	97 CT 3 BRN
Deep Creek	DPCK-1	26.	2	28	27-29	52	21	96 CT 4 BRN
Squaw Creek	SACK-1	35	1	36	36-36	43	19	100 CT
S. Fk. Tincup Cr.	SFTC-1	39	14	61	48-73	61	18	100 CT
Bear Canyon Creek	BCCK-1	50	7	58	55-61	112	73	100 CT
Sage Creek	SOCK-1	167	62	266	238-293	124	25	83 BRN 17 CT
M. Fk. Sage Cr.	MFSG-1	39	18	72	49-94	46	12	100 BRN

two stations. Although habitat likely played a role in the high densities observed, we suspect that some of the fish in this station had drifted out of the South Fork Tincup Creek due to low water levels.

Cutthroat trout sampled from TCCK-2 were nearly identical to those captured in TCCK-1 in terms of mean length, range, and the percent larger than 200 mm (Table 13). In addition, we collected three juvenile brown trout ranging from 210-239 mm in total length.

Habitat in TCCK-3 consisted of virtually 100% shallow riffle and pocketwater with a cobble substrate. As a result, this station contained primarily juvenile cutthroat trout with very few fish exceeding 140 mm in length when compared to the other two stations (Figure 14). Nonetheless, the density of 90 mm+ trout was nearly identical to that observed in TCCK-1.

South Fork Tincup Creek

This stream is the largest tributary to Tincup Creek and is of major significance in terms of potential spawning and rearing habitat for migratory fish. The lower reaches of the South Fork have been impacted somewhat due to a sheep driveway but overall, habitat throughout the drainage is in good condition. During our sampling, water levels were extremely low and trout were concentrated in large beaver dams and any remaining pools.

We estimated that 61 cutthroat trout in excess of 90 mm were present in the 100-m long electrofishing station, or 18 fish/100 m^2. Cutthroat trout ranged in length from 50-272 mm and averaged 87 mm in length, a figure well below that observed in mainstream Tincup Creek stations. Only 2% of all fish captured exceeded 200 mm in length.

The South Fork reportedly sustains **a** sizable spawning run of fish from Tincup Creek. In addition, good numbers of 250-350 mm cutthroat trout reside in the stream, particularly in large beaver dam complexes located upstream from our sampling site (Bob Saban, IDFG, personal communication).

Bear Canyon Creek

In terms of drainage area, Bear Canyon Creek is the second largest tributary in the Tincup Creek drainage. As with the South Fork, portions of this stream have been heavily impacted by sheep concentrations in the riparian zone.

Despite these impacts and its small size, Bear Canyon Creek appears to be an important spawning and rearing stream for the Tincup Creek fishery. This stream supports a sizable spawning run from Tincup Creek and is fished heavily by local anglers (Bob Saban, IDFG, personal communication). We estimated that 75 fish/100 m^2 were present in the single electrofishing station, or nearly three times as many trout per unit area as observed in

Table 13. Salmonids collected by electrofishing, Tincup and Jackknife drainages, 1987.

Stream	Transect	Date	Species	Number of fish	Percent of sample	Range length (mm)	Mean length (mm)	Percent larger than 200 mm
Tincup Creek	TCCK-1	9/29	CT	108	99	52-296	123	8
			BT	1	1	-	510	100
Tincup Creek	TCCK-2	9/29	CT	188	98	42-291	137	10
			BT	3	2	210-239	223	100
			RB/CT	1	<1	-	258	100
Tincup Creek	TCCK-3	9/29	CT	68	100	89-233	132	3
Jackknife Creek	JKCK-1	9/30	CT	38	97	80-340	149	16
			BT	1	3	-	289	100
Deep Creek	DPCK-1	9/30	CT	109	99	42-184	77	0
			BT	1	1	-	176	0
Squaw Creek	SQCK-1	9/30	CT	50	100	52-168	101	0
S. Fk. Tincup Cr.	SFTC-1	10/1	CT	136	100	50-272	87	2
Corral Creek	CRCK-1	9/30	CT	16	100	46-107	60	0
Bear Canyon Creek	BCCK-1	9/30	CT	172	100	46-170	79	0
Sage Creek	SGCK-1	10/1	CT	37	14	73-262	183	27
			BT	197	74	81-390	152	21
			WF	33	12	-	-	-
M. Fk. Sage Cr.	MFSG-1	10/1	BT	56	100	105-365	141	7

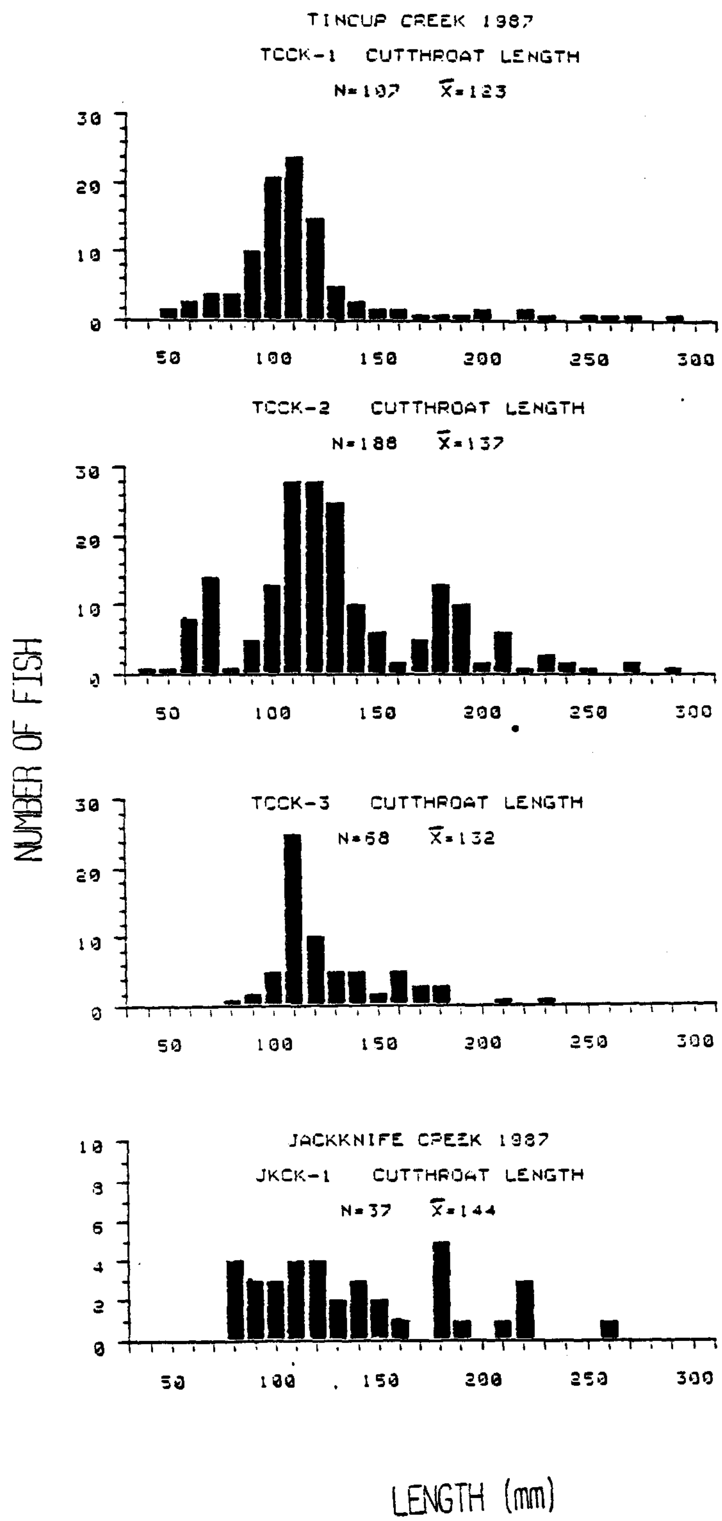

Figure 14. Length distribution of cutthroat trout sampled from electrofishing stations in the Tincup, Jackknife, and Crow Creek drainages, September-October, 1987.

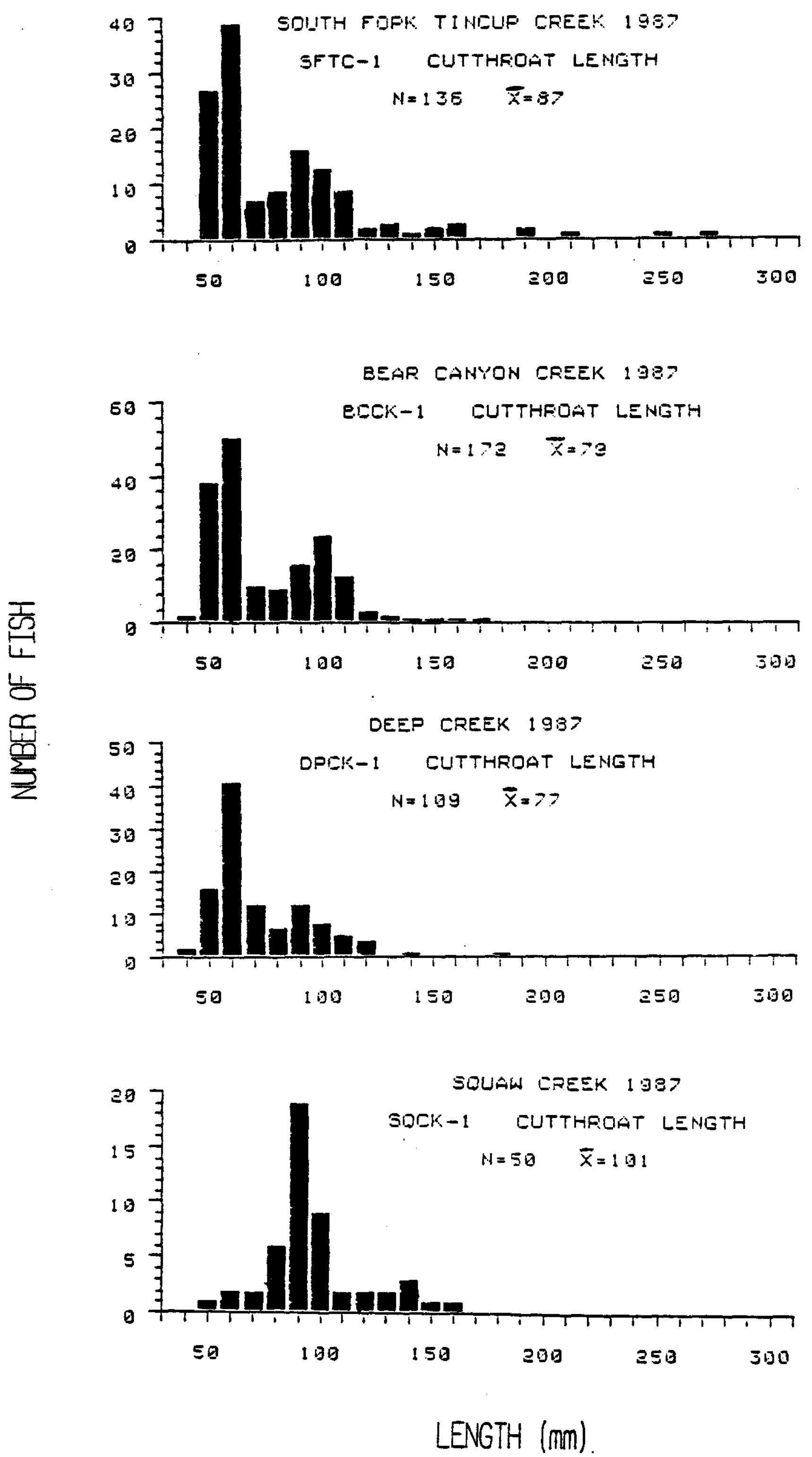

Figure 14. Continued.

any other station. In fact, this density is over twice as great as we observed in any regional sampling during the past two field seasons. It is possible that the high trout density we observed was a sampling aberration but habitat in the station was representative of the stream as a whole.

Cutthroat trout was the only gamefish collected, ranging in length from 46-170 mm. The average length of these fish was only 79 mm. There appeared to be very little available habitat for fish in excess of 200 mm and many fish presumably emigrate to Tincup Creek upon attaining some unknown size.

Corral Creek

Corral Creek is a small stream (x width = 1.3 m) entering Tincup Creek from the west. The stream drops sharply over a number of large boulders at its mouth that may form a complete or partial barrier to Tincup Creek spawners. We captured 16 cutthroat trout in a single pass through a 37 m section. Several age classes were present and fish ranged from 46 to 107 mm in total length. There are several beaver dam complexes in upper reaches of this stream that have the potential to rear larger fish.

Jackknife Creek

Jackknife Creek is one of four major Idaho tributaries to the Salt River and is similar in size to Tincup Creek. We electrofished a station on mainstream Jackknife Creek approximately 450 m above the mouth of Cabin Creek. Riparian vegetation within the station had been impacted by cattle and all available gravel substrate was heavily embedded. However, the station did contain several deep pools.

Trout numbers (90 mm+) were the lowest observed during the 1987 inventory at 6 fish/100 m^2. This density was less that half that observed in three stations on Tincup Creek, a similar sized stream.

Ninety-seven percent of all fish collected were fine-spotted cutthroat trout. They ranged in length from 90 mm to 340 mm and averaged 149 mm. We electrofished no fry in the station, presumably because of the poor spawning substrate. In addition, we sampled a single 289 mm brown trout in the station, or 3% of all fish captured.

Deep Creek

Deep Creek is one of three major tributaries to Jackknife Creek. Riparian habitat within the electrofishing station had been heavily impacted by cattle grazing, as evidenced by trampled banks and a widened stream channel.

Despite the grazing impacts, we estimated that 28 trout (90 mm+) were present in the station, or 21 fish/100 m^2. Cutthroat trout comprised 96% of all trout sampled and ranged in length from 42-184 mm in total length.

The stream appears to produce good numbers of cutthroat fry. Over half of all trout captured in DPCK-1 were less than 80 mm in length (Figure 14). In addition to fine-spotted cutthroat trout, we captured a single juvenile brown trout 176 mm in length.

Squaw Creek

As in the two previous streams, riparian habitat in Squaw Creek has been impacted by cattle grazing activities. Fine-spotted cutthroat trout was the only salmonid captured in SQCK-l. We estimated that a total of 36 trout (90 mm+) were present in the 84-m long section, or 21 fish/100 m^2. Trout collected ranged from 52-168 mm in length and averaged 101 mm. We sampled no trout in excess of 200 mm from this station.

Sage Creek

This stream is the largest tributary to Crow Creek, one of four major Idaho streams draining east into the Salt River. Sage Creek lies primarily on private ground and has been grazed heavily. Riparian vegetation in the station, which lies just above the Crow Creek Road, has been virtually eliminated due to streambank trampling.

The density of age I+ and older trout in SGCK-1 was estimated to be 25 fish/100 m^2. In contrast with all stations sampled in the Tincup and Jackknife drainages, brown trout comprised the majority of salmonids sampled in Sage Creek (74X). Brown trout ranged from 81-390 mm in length and averaged 152 mm (Figure 15). The Sage Creek drainage has been identified as a major spawning area for either Crow Creek or Salt River brown trout populations based on redd observations made the previous year (Heimer et al. 1987).

Fine-spotted cutthroat trout was the next most prevalent species, comprising 142 of all salmonids captured. Cutthroat trout in SGCK-1 averaged 183 mm in length, well above means reported previously for Tincup and Jackknife drainages. In addition, 27% of these fish exceeded 200 mm in length despite signs of heavy angler use in the area.

SGCK-1 also supported a population of whitefish that comprised 12% of all salmonids collected. We estimated that 23 adult whitefish (100 mm+) were present in the station, or 2 fish/100 m^2. Heimer et al. (1987) reported the presence of whitefish in a nearby electrofishing station in Crow Creek and a fall density estimate of 19 fish/100 m^2 in Stump Creek, a nearby Salt River tributary. All adult whitefish sampled in SOCK-1 were ripe and no spent females were observed. In addition to the adults, 10 juvenile whitefish (<100 mm) were collected indicating that some rearing occurs in this stream despite its small size.

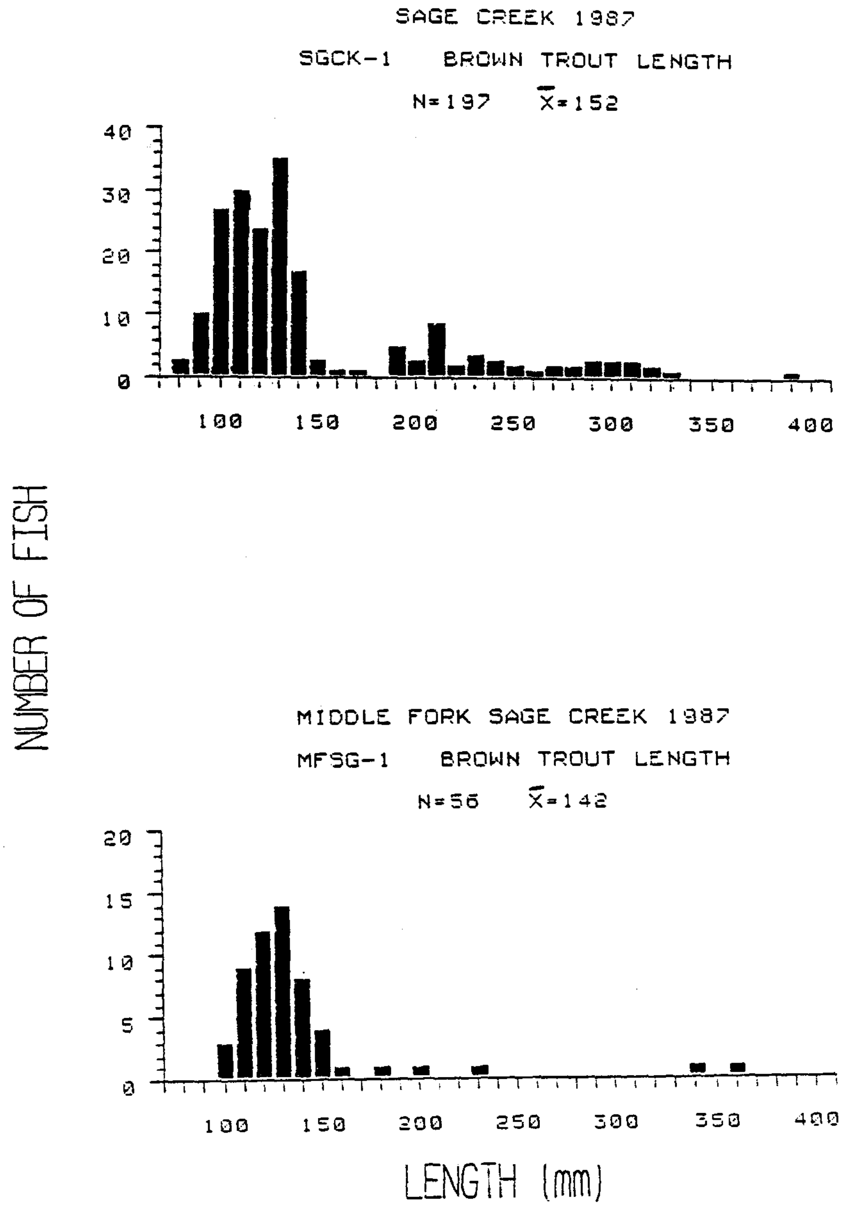

Figure 15. Length distribution of brown trout sampled by electrofishing in the Sage Creek drainage, 1 October, 1987.

Middle Fork Sage Creek

The Middle Fork is a 0.8 km spring creek that emerges approximately 100 m above the upper boundary of our electrofishing station. Trout habitat in this stream is excellent with abundant instream cover provided by dense watercress beds. Spawning substrate in the Middle Fork is in excellent condition.

We estimated that 72 trout (90 mm+) were present in the 155 m section, or 12 fish/100 m^2. However, large numbers of trout escaped capture on both runs by burrowing into the watercress beds and we suspect that the true population density was underestimated.

Brown trout were the only salmonids captured within MFSG-1, ranging in length from 105-365 mm in length. However, over 90% of these fish were less than 150 m in length.

The stream appears to function primarily as a spawning and rearing stream for nonresident brown trout.

Brown Trout Spawning Evaluation

Sage Creek

On 1 October, we hiked approximately 1.7 km of this stream from the Crow Creek Road to the next road crossing. We observed no redds or spawning activity. On 24 October 1986, numerous redds were observed in the same stream segment although a total count was not conducted (Heimer et al. 1987). The redds observed in 1986 were quite large and obviously constructed by nonresident migrants, presumably from the Salt River. The three-week discrepancy between the two years' count dates may explain the lack of spawning activity observed this year.

Middle Fork Sage Creek

On 1 October, we hiked the entire length of the Middle Fork and observed a total of 13 redds. Heimer et al. (1987) reported 21 redds were present in the same stream reach on 24 October 1986. During 1986, we observed a number of larger redds likely constructed by nonresident fish. We suspect the activity we observed this year was limited to residents from the Middle Fork or Sage Creek itself. Again, as with main Sage Creek, the difference in count dates may explain the lack of large nonmigrants. However, we anticipated an early spawning run this year because of low water levels. Another possible explanation for the lack of large spawners may be the formation of upstream barriers at diversion structures on Crow Creek given the near-record low flows. The status of fish passage and number of diversion structures within the Wyoming segment of Crow Creek are unknown.

St. Charles Creek

Natural Stream Channel

With the exception of limited road encroachment at several points, fisheries habitat in St. Charles Creek is in good condition above the forest boundary. Portions of the stream in lower reaches have been heavily impacted by agricultural activities and irrigation withdrawal. Trout densities (TL>90 mm) in those stations located on natural stream channel averaged 15 fish/100 m^2 but ranged from 2-36 fish/100 m^2 (Table 14).

The poorest densities were observed on the lowermost station on the stream (SCCK-1). This station was located on the South Fork or Little Creek, approximately three miles from Bear Lake. Heavy grazing in this segment of the stream has resulted in a wide.stream channel, limited pool structure, and high embeddedness levels. The GAWS Habitat Condition Index (HCI) rating of 70 lies on the cutoff point between poor and fair habitat for C-type streams (Table 15).

Wild cutthroat juveniles comprised nearly all the trout in SCCK-1 (96%). These fish ranged in length from 100-185 mm (Figure 16). We observed no fry or adult fish during electrofishing. Various investigators in southeastern Idaho have reported fall emigration of juvenile cutthroat trout in apparent response to impending winter habitat conditions (Thurow 1980; Moore 1981; Moore and Schill 1982).

The proximity of this station to Bear Lake and the lack of age classes other than juveniles suggest that these fish may have been staging or actively recruiting to the lake. Additional sampling in reference to movement is necessary to confirm such a movement pattern.

SCCK-3 is the next sampling station located on natural stream channel. This station was located immediately below the Highway 89 Bridge on the fork of St. Charles Creek commonly referred to as Big Creek. This segment of stream contains some of the best trout habitat we have sampled in the last two years. Dense woody vegetation including willows and dogwood overhung most of the station and presumably limit angler access. Excellent spawning gravel was available in small pockets throughout this station. Not surprisingly, the GAWS Habitat Condition Index was high (91%).

The density of trout exceeding 90 mm in SCCK-3 (36 fish/100 m^2) was the highest observed in any St. Charles Creek Station. Fifty-four percent of these fish were brook trout, with wild rainbow, wild cutthroat, and RB x CT hybrids comprising 34, 10, and 1%, respectively.

In contrast with SCCK-1, a wide range of fish sizes were represented. Brook trout ranged in length from 75-269 mm and rainbow trout up to 303 mm were present (Table 16). This station also contained the largest fish sampled in the entire drainage, a 455 mm cutthroat trout. This fish was obviously a large postspawning migrant from Bear Lake. Presumably it ascended St. Charles Creek via the South Fork (Little Creek) and descended

Table 14. Population estimate summary for 90 mm+ trout in St. Charles Creek electrofishing stations, September, 1987.

Stream	Station name	90 mm+ trout collected C_1	C_2	C_3	Population estimate	Confidence limit (.05)	Fish/ 100 m	Fish/ 100 m^2	Species[a] composition
St. Charles Creek	SCCK-1	20	5	-	27	21-31	15	2	96% WCT 4% EBK
Ditch Number 1	SCCK-2	-	-	-	0	–	0	0	–
St. Charles Creek	SCCK-3	47	22	-	88	61-115	210	36	54% EBK 34% WRB 10% WCT 1% RBCT
Ditch Number 2 (Upper diversion)	SCCK-4	8	4	-	16	2-30	20	6	58% EBK 17% WRB 17% RBCT 8% WCT
St. Charles Creek	SCCK-5	32	7	-	41	37-45	56	9	51% EBK 28% WRB 13% WCT 3% HCT 3% RBCT
St. Charles Creek	SCCK-6	65	28	-	114	89-139	127	20	61% EBK 17% WCT 16% WRB 5% RBCT
Ditch Number 3 (at diversion point)	SCCK-7	11	-	-	-	-	-	-	36% WCT 27% WRB 18% HCT 9% RBCT 9% EBK
North Fork St. Charles Cr.	SCCK-8	8	8	1	20	13-27	26	6	35% RBCT 29% EBK 24% WCT 12% HRB

[a] WCT = wild cutthroat trout, EBT = brook trout, WRB = wild rainbow trout, RBCT = rainbow x cutthroat hybrid, HCT = hatchery cutthroat trout, HRB = hatchery rainbow trout.

Table 15. Summary of selected GAWS survey results on St. Charles Creek electrofishing stations, October, 1987.

Station name	Stream[a] type	Percent stream[b] bottom	Percent banks[c] cover	Percent bank soil[d] stability	Potential spawning area (m²)[e]	damage[f]	Habitat condition (HCI)[g]
SCCK-1	C	38.6	75	90	0	84	70
SCCK-2	C	69	96	100	32	100	91
SCCK-8	A	62	70	100	107	100	64

[a] From Rosgen (1985).
[b] O of Station substrate from gravel to cobble size.
[c] a rating of optimum in terms of streambank vegetative cover.
[d] a of optimun rating.
[e] Spawning area in station (gravel).
[f] % of streambanks undamaged by grazing activities.
[g] Relative index of overall habitat quality for salmonids.

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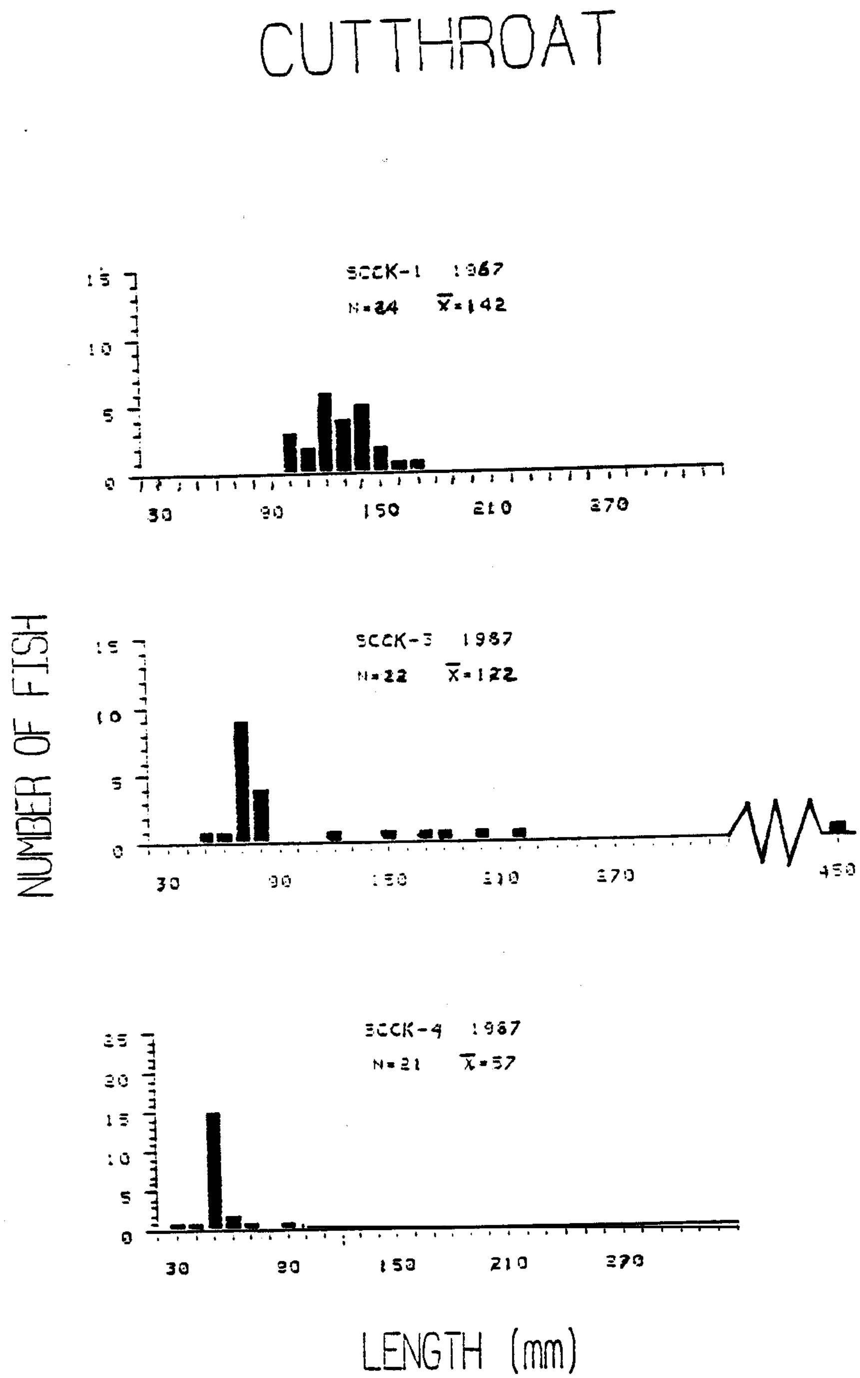

Figure 16. Length distributions of wild cutthroat trout in St. Charles Creek electrofishing stations, fall, 1987.

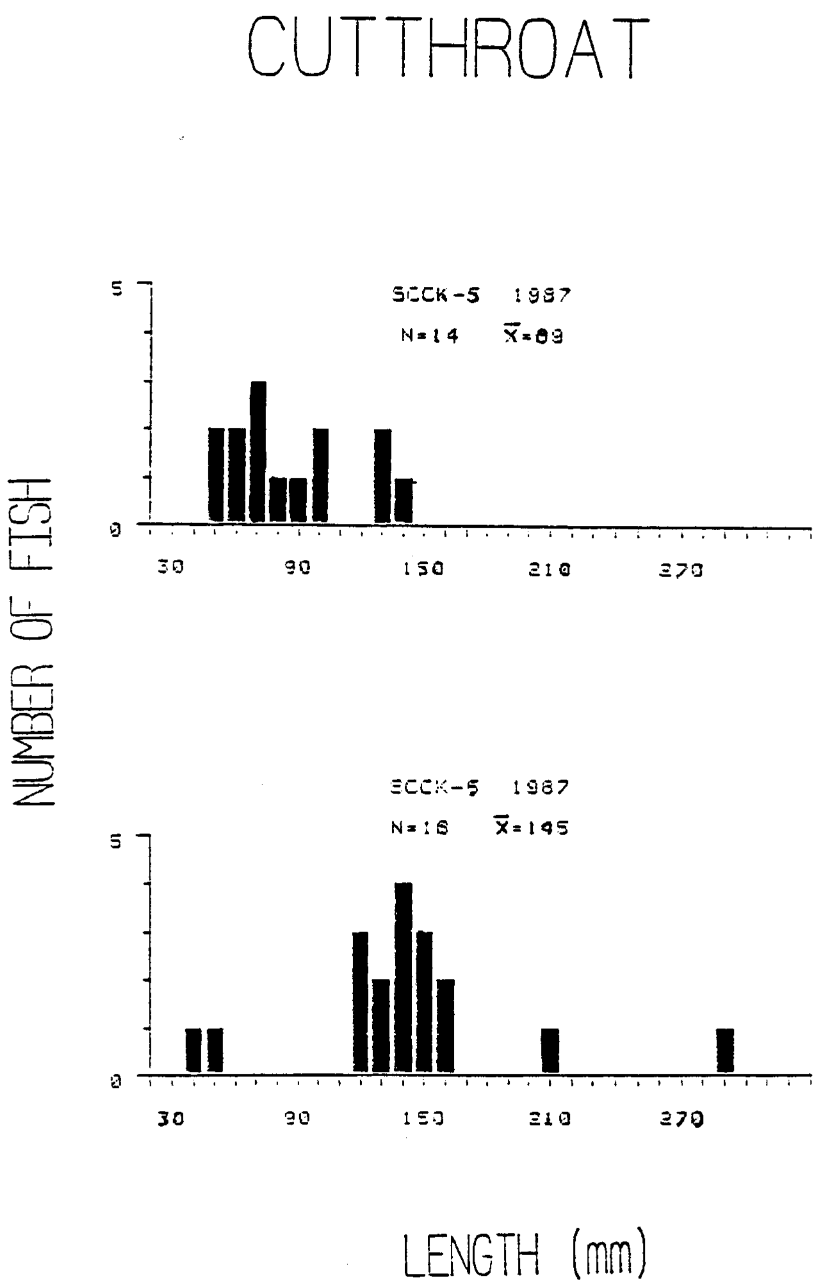

Figure 16. Continued.

Table 16. Salmonids collected during electrofishing survey, St. Charles drainage, September, 1987.

Stream	Station	Date	Species	Number of fish	Percent of sample	Length range (mm)	Mean length (mm)	Percent larger than 200 mm
St. Charles Creek	SCCK-1	9/17/87	CT	24	92	110-185	142	0
			EBK	2	8	90-98	94	0
Ditch Number 1	SCCK-2	9/16/87	-	0	-	-	-	-
St. Charles Creek	SCCK-3	9/17/87	EBK	39	46	75-269	162	26
			RB	23	27	100-303	176	39
			CT	8	9	70-455	198	38
			RBCT	1	1	166	166	0
			FRY	14	16	50-89	72	0
Ditch Number 2	SCCK-4	9/16/87	EBK	41	61	56-285	92	5
			RB	3	5	80-220	138	33
			CT	2	3	76-97	87	0
			RB/CT	2	3	102-108	105	0
			FRY	19	28	38-68	54	0
St. Charles Creek	SCCK-5	9/17/87	EBK	24	46	72-255	151	21
			RB	12	23	82-234	140	8
			WCT	6	12	98-142	119	0
			HCT	1	2	-	143	0
			RB/CT	1	2	-	275	100
			FRY	8	15	50-87	67	0
St. Charles Creek	SCCK-6	9/03/87	EBK	65	64	70-275	175	28
			RB	14	14	141-371	217	50
			CT	18	17	45-291	145	11
			RB/CT	5	5	101-231	170	20
Ditch Number 3 (Upper diversion)	SCCK-7	9/17/87	EBK	1	8	-	228	100
			RB	3	23	110-125	118	0
			WCT	4	31	185-213	200	75
			HCT	2	15	202-220	211	100
			RBCT	1	8		244	100
			FRY	2	15	65-67	66	0
St. Charles Creek	SCCK-8	9/03/87	EBK	5	29	168-243	211	60
			HRB	2	12	229-318	274	100
			WCT	4	24	128-170	142	0
			RB/CT	6	35	168-196	181	0

into the Big Creek Fork following spawning activities. The number of Bear Lake cutthroat that spawn above the forks in St. Charles Creek and descend into Big Creek is unknown. Certainly a substantial percentage of those that do are lost as winter mortalities, either in Big Creek itself or the Dingle Marsh.

A substantial percentage of fish in SCCK-3 exceeded 200 mm in length (Table 16) perhaps in response to both superior habitat and limited angler accessibility. In addition, unknown fry (wild rainbow or wild cutthroat) comprised 16% of all fish sampled.

St. Charles Creek-5 was located approximately 500 m above the major forks in the stream. Quantitative habitat data was not collected at this 73 m site. On a general basis, habitat quality was excellent with several deep pools (2.5 m) and a substantial amount of overhead cover in the form of woody vegetation. Portions of the stream were bordered by a pasture but streambank trampling was not a major problem.

Trout densities in this station (9/100 m^2) were modest in comparsion to several other sites in the drainage. Habitat in this station appeared to have better potential. However, during the latter portion of the second electrofishing run we experienced some equipment problems and suspect the total population was slightly underestimated. In addition, this segment of the stream is popular with both local and nonresident anglers and receives a substantial amout of effort (Glen Page, IDFG, personal communication).

Again, brook trout comprised the majority of fish exceeding 90 mm (51%) followed by wild rainbow and cutthroat trout totaling 28 and 13%, respectively. We sampled a lone hatchery cutthroat trout at this station as evidenced by fin erosion and pink grit dye. An estimated 5,000 hatchery cutthroat were planted in St. Charles Creek during May to supplement the wild fishery in heavily utilized areas upstream.

The next station (SCCK-6) was located in the center of the drainage approximately 1 km below the forest boundary. This station can be characterized as a series of excellent pools isolated by short riffles. Nearly all the pools contain woody debris jams. Stream gradient is fairly low but excellent spawning gravel exists in small pockets. In past years, IDFG personnel have observed large migrant cutthroat (>3 kg) spawning within this station.

Trout densities in SCCK-6 were the second highest observed within the drainage (20 fish/100 m^2). Brook trout comprised most of the population over 90 mm in length (61X). Wild cutthroat and rainbow densities were similar, totaling 17 and 16X, respectively, followed by hybrids (51).

Four to five km of St. Charles Creek above and below the station can, in general, be characterized by the same low gradient and excellent pool quality. Brook trout comprise the bulk of the trout catch in this area. The larger size of brook trout in this station (75% >150 mm, $\bar{x}$=175 mm) probably make them more acceptable to anglers than smaller fish in other segments of the drainage (Figure 17).

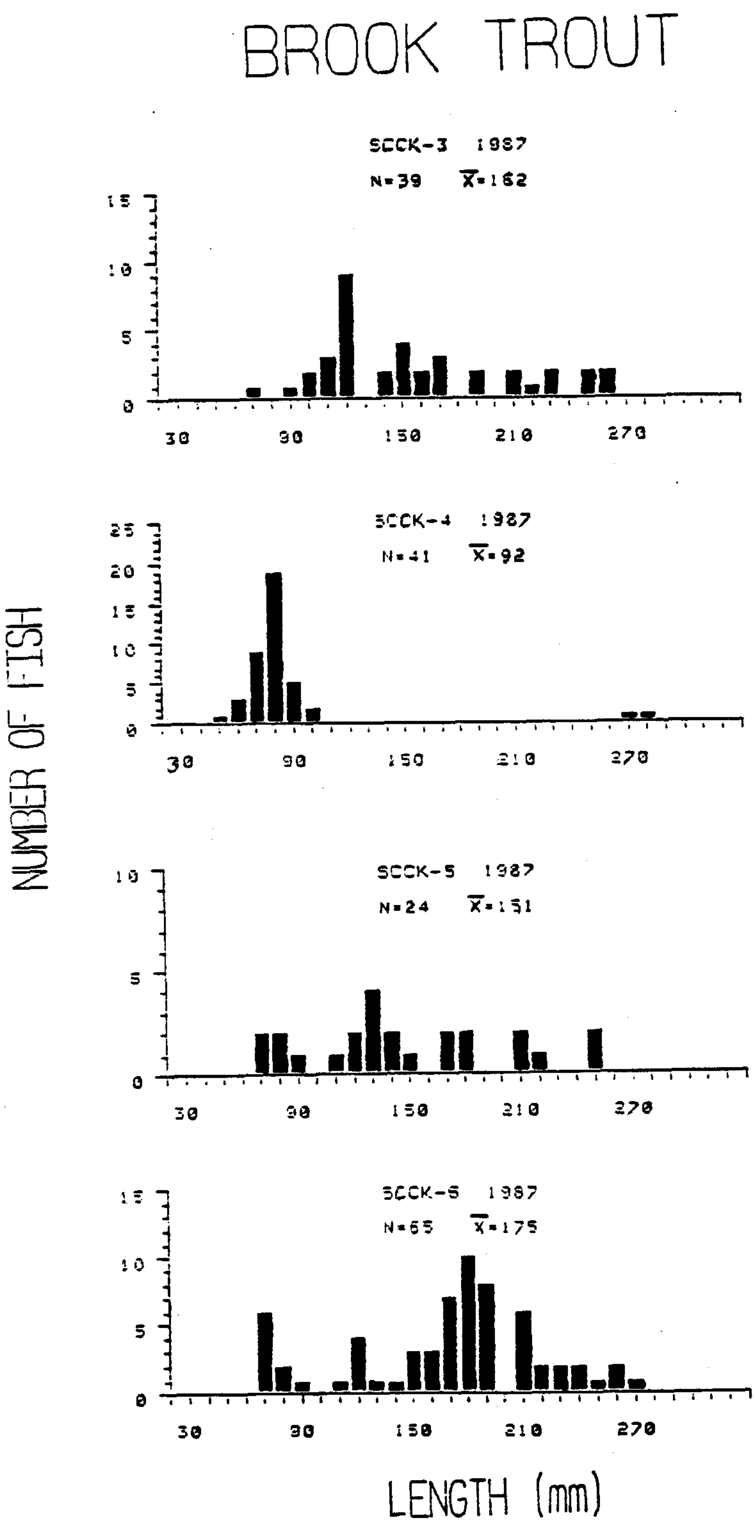

Figure 17. Length distributions of wild brook trout in St. Charles Creek electrofishing stations, fall, 1987.

SCCK-6 also contained the only two wild rainbow trout in excess of 300 mm that we electrofished within the drainage (Figure 18). Most of the rainbow trout exceeding 200 mm were caught in the last 20 mm of the station in two heavy riffles flowing through dense willows. Wild rainbow trout of this size appear in the creel infrequently (Glen Page, IDFG, personal communication), presumably because of their inaccessibility to anglers.

The uppermost station (SCCK-8) was located on the North Fork of St. Charles Creek approximately 400 m above the parking area for the North Fork trail. This segment of stream can be characterized as high gradient with a boulder/cobble substrate (A-type stream). Rearing habitat and spawning substrate are limiting factors for fish production. The GAWS HCI value for the station was 64, a good rating rating for an A-type stream.

Trout densities (>90 mm) in SCCK-8 were the second lowest observed in the drainage (6 fish/100 m^2). Wild trout composition was well divided between RB x CT hybrids (35%), brook trout (29%), and cutthroat trout (24%). The percentage of fish in SCCK-8 exhibiting obvious hybridization was much higher than for other stations.

In addition, we captured two hatchery rainbow trout in this station. These fish were holdovers from the 1985 catchable plants. These fish displayed excellent body condition and had moved upstream from their original planting site because SCCK-8 is located above any roaded access. In 1986, we discontinued the catchable rainbow program in St. Charles Creek and began supplementing the wild fishery with hatchery cutthroat in an attempt to reduce further hybridization of the Bear Lake gene pool.

We sampled no fry within the SCCK-8 station. The heavy pocketwater was not suitable for small fish but poor visibility and high velocities make it unlikely we would have recovered fry if they did exist.

Diversion Sampling

We electrofished within segments of three irrigation diversions on St. Charles Creek. We observed no fish in a single pass through the lowermost station (SCCK-2) on Ditch Number 1. Water quality was excellant and we visually estimated water flow at 2-3 cfs. Several areas in the station appeared to be suitable as trout holding areas. While we observed no fish in the canal, the landowner informed us that trout are stranded in the canal following headgate closure each year.

Based on electrofishing, the loss of fish to Ditch Number 2 (SCCK-4) appears to be much more significant. The density of trout in excess of 90 mm in this station (6 fish/100 m^2) was only one-third less than the estimated densities in the natural stream channel only 100 m to the north. Eastern brook trout comprised the bulk of the population (>90 mm) while wild rainbow, hybrids, and cutthroat trout followed in order of abundance at 17, 17, and 8Z, respectively. In addition, this station contained a large number of fry (<90 mm), although a total estimate was not attempted. We collected a total of 33 brook trout and 14 unidentified (rainbow or cutthroat) fry.

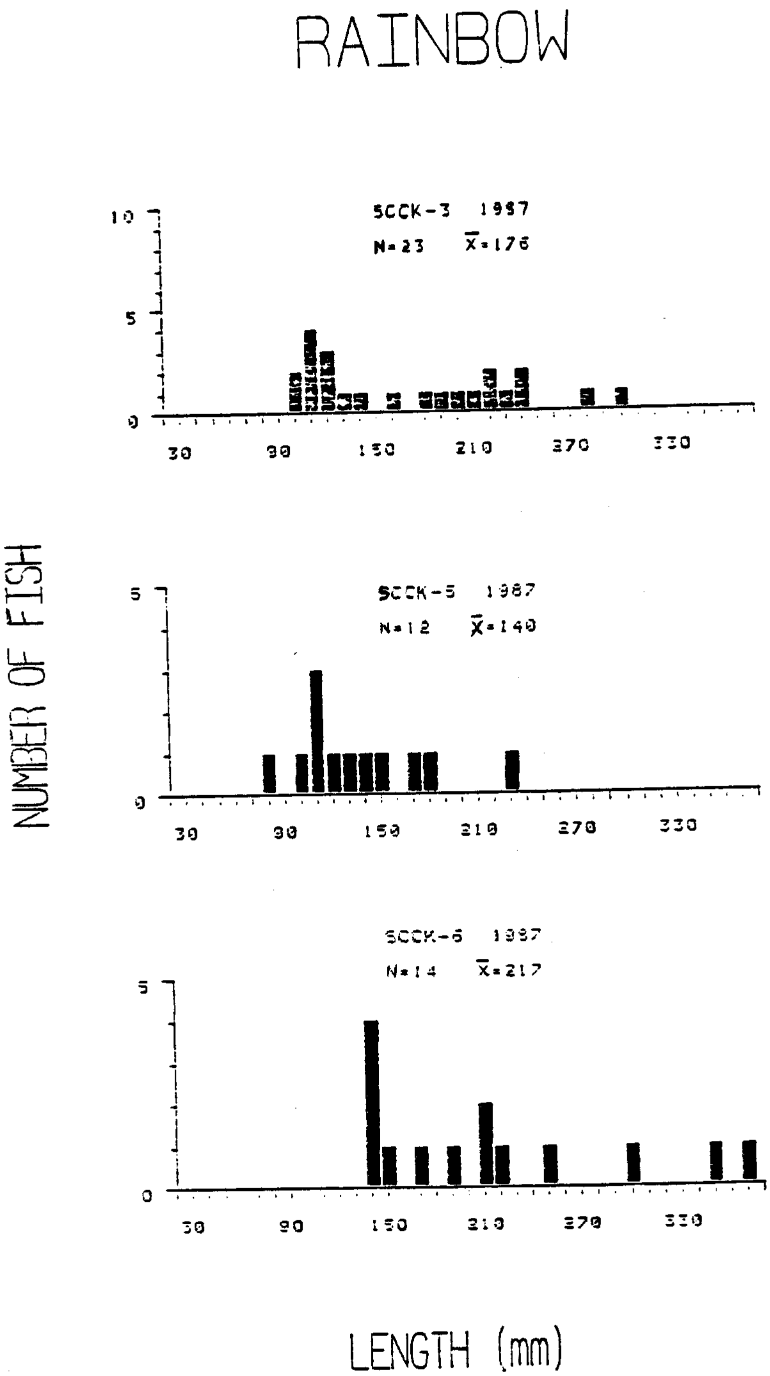

Figure 18. Length distributions of wild rainbow trout in St. Charles Creek electrofishing stations, fall, 1987.

Habitat in this segment of the ditch (SCCK-4) was poor. The channel was rectangular shaped and the stream bottom was virtually homogeneous. Other portions of this canal contain better habitat and, undoubtably, higher densities of fish. Water flow in the ditch was visually estimated at 2-3 cfs within SCCK-4, approximately 500 m below the initial headgate. However, a secondary headgate located 10 m above the station was returning most of the canal flow to St. Charles Creek, presumably because of low irrigation demand. During the peak irrigation period, this canal probably removes 5-7 cfs from the stream. This ditch appears to have major fishery impacts and fish losses should be investigated further.

Ditch Number 3, commonly referred to as the upper diversion, appears to be the largest diversion on St. Charles Creek. The diversion headgate was closed during our sampling and flow was limited to leakage (approximately 0.1 cfs). This diversion appears to accommodate 10 cfs during peak demand periods.

In contrast with the two diversions discussed previously, a large diverision dam is used to channel water to the headgate. The dam is approximately 1-1.5 m high, depending on board height. A concrete apron located immediately below the dam effectively eliminates spill erosion. The combination of the dam and apron could well form a complete upstream barrier to cutthroat migration in low flow years. However, large Bear Lake spawners have been observed upstream of the diversion point. Fish can apparently traverse the dam in normal or high water years.

We sampled a 50 m segment of the canal immediately below the headgate structure (SCCK-7). Equipment malfunction prohibited attempts at population enumeration and we were only able to collect the largest fish in this short station. Large numbers of fish less that 120 mm in length were not collected. Wild trout collected included brook, rainbow, and cutthroat trout as well as a lone hybrid. In addition, two hatchery cutthroat (grit marked) were collected (Table 16).

Water depths in the canal were very low (<100 mm) and we visually estimated trout numbers in the upper 150 m of canal at 200 fish including fry. We hiked on additional 200-300 m of the canal and trout densities declined markedly. Several stranded fish were present, however. Whether densities of stranded fish in the remainder of this long canal (8-10 km) remain low is unknown. Additional work evaluating losses to this canal is needed.

Portneuf River

Population Monitoring

We made two recapture runs in the river segment between the Steel Bridge and Utah Bridge. An estimated 1,442 fish were present in this section including 366 wild rainbow, 1,017 hatchery rainbow, and 59 wild cutthroat (Table 17). Wild rainbow trout abundance was down 29% from the 1979-1986 average of 511 fish. Likewise, wild cutthroat numbers were down 631 from the 1979-1986 average of 158 fish.

Table 17. Population estimates in an approximate 3.0 km section of the upper Portneuf River from the Steel Bridge downstream to the Utah Bridge.

Year	Wild rainbow	Hatchery rainbow	Cutthroat	Total	Confidence limits 95%
1979	308	47	22	377	+142
1980	624	104	139	867	+193
1981	185	120	19	324	+105
1982	432	95	100	627	+444
1983	540	200	91	831	+334
1984	668	161	281	1,110	804-1579
1985	697	214	339	1,250	995-1,567
1986	634	620	273	1,537	1,098-2,561
1987	366	1,017	59	1,442	1,147-1,942

An obvious relationship exists between the number of wild rainbow and cutthroat trout present in the river on a yearly basis (Figure 19). Results of a Spearman's rank correlation (Zar 1974) testing estimated numbers of both species present in the years 1979-1987 indicate that this relationship is statistically significant ($P=.05$, $N=9$, $R_s=.983$). Not surprisingly, environmental factors responsible for year-class strength appear to be affecting both populations equally. Hatchery rainbow numbers are determined to a large extent by the number of fish released and downstream drift from Chesterfield Reservoir.

The mean total length of hatchery rainbow and cutthroat trout collected in 1987 was 250 mm and 315 mm, respectively. The mean total length of 117 wild rainbow trout was 222 mm (Figure 20). Forty percent of these fish were in the 153 mm to 203 mm length range.

South Fork Toponce Creek

The lower sampling station (SFKTCK-1) was located in a 99-m long beaver dam pool averaging 5.4 in width. Riparian vegetation consisted of willows along the right bank and sedges on the left. Bank stability was good, in general, but has been impacted in a 10 m segment from trail encroachment.

We estimated that 25 trout/100 m^2 in excess of 90 mm were present in the station. Wild cutthroat comprised the majority of fish sampled (88%) and ranged in length from 70 to 325 mm (Figure 21). The 325 mm fish was larger than any salmonid captured during an extensive inventory of four upper Portneuf River tributaries (Twenty-four Mile, Pebble, King, and mainstream Toponce creeks) last year (Heimer et al. 1987). The mean length of cutthroat in SFKTCK-1 was 173 mm.

The remaining trout sampled in this station (12X) were classified as wild rainbow although most showed considerable hybridization with cutthroat trout. These fish ranged in length from 70 to 295 mm in length and averaged 131 mm.

The upper station SFKTCK-2 was located in a 113-m long free-flowing stretch approximately 100 mm above SFKTCK-1. Riparian habitat was in good condition but low water flows limited trout to small pools. An estimated 13 trout/100 m^2 were present, or just over one-half the density observed in Station 1.

Cutthroat trout again comprised the majority (96X) of trout within SFKTCK-2. The mean length of these fish (131 mm) was well below that observed within the lower station, presumably as a result of limited pool depth. However, a 290 mm cutthroat sampled in this station was also larger than any wild trout sampled in Portneuf River tributaries last year.

The cutthroat trout was by for the most numerous trout sampled in both South Fork stations. In contrast, the remainder of Toponce Creek supports predominately wild rainbow trout. They comprised 93 and 75% of all trout sampled in two mainstream Toponce Creek stations (Heimer et al. 1987).

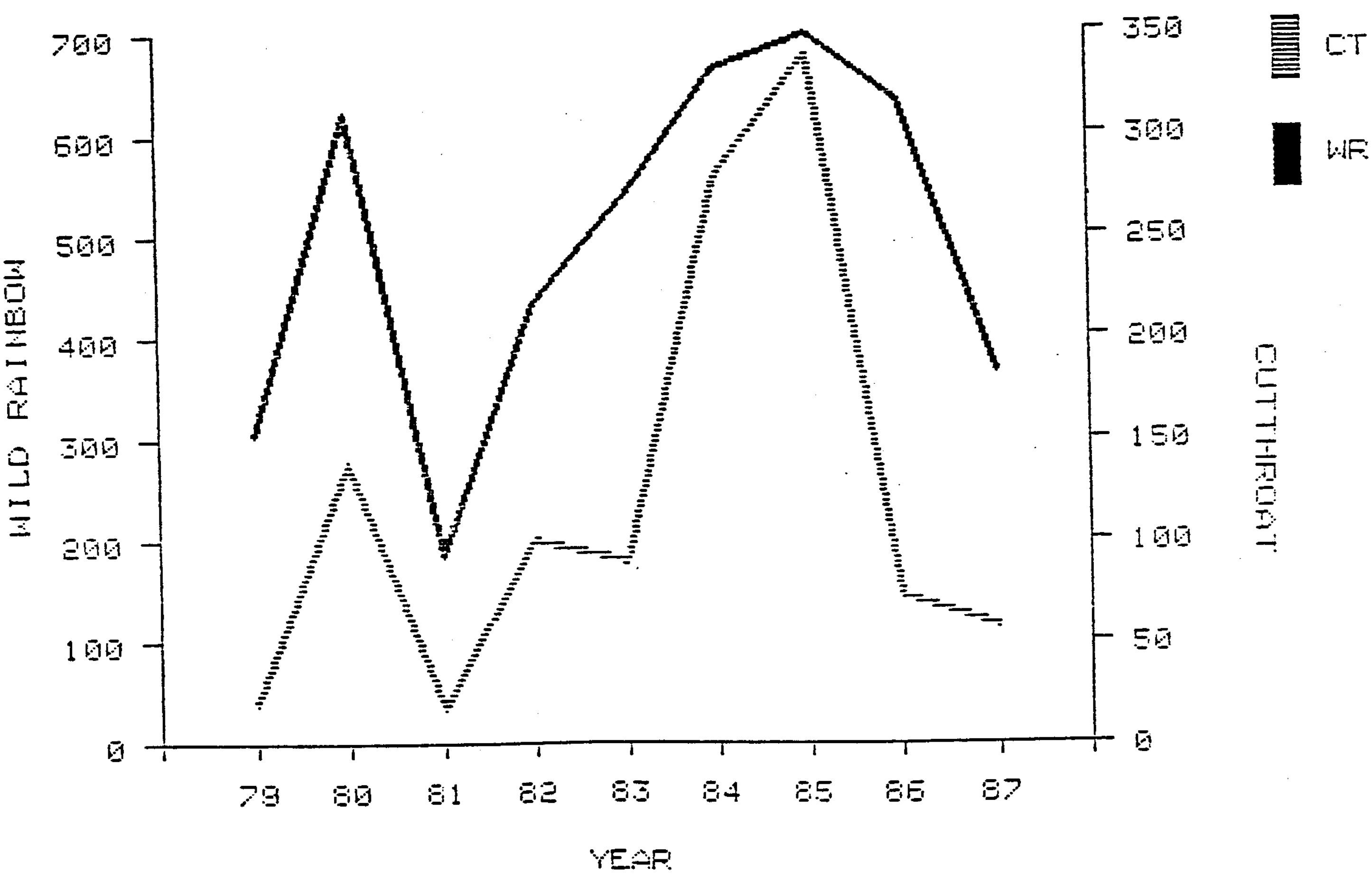

Figure 19. Estimated numbers of wild rainbow and cutthroat trout present in the Utah Bridge electrofishing station, October, 1979-1987.

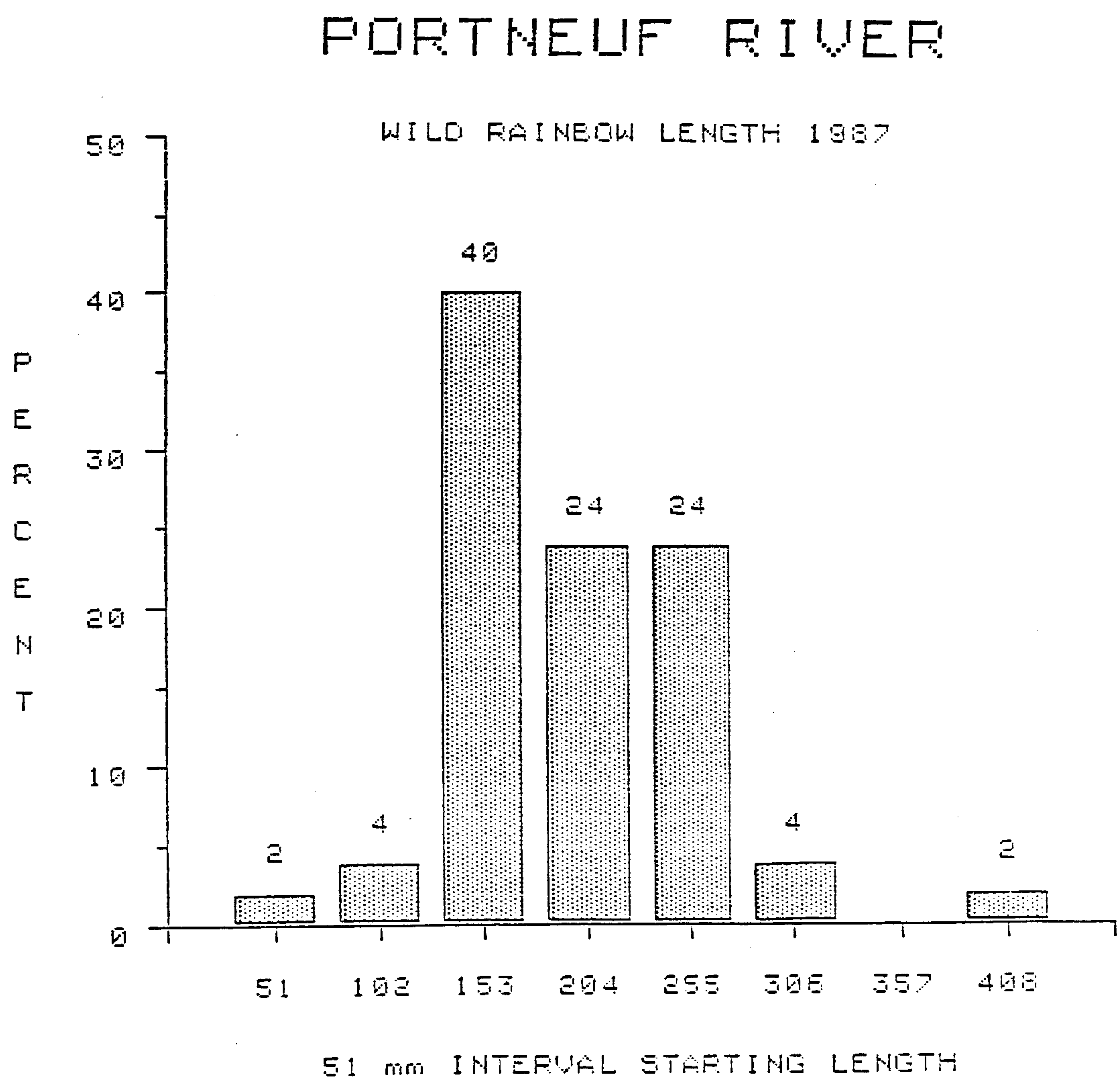

Figure 20. Length frequency of wild rainbow trout sampled by electrofishing, upper Portneuf River, October, 1987.

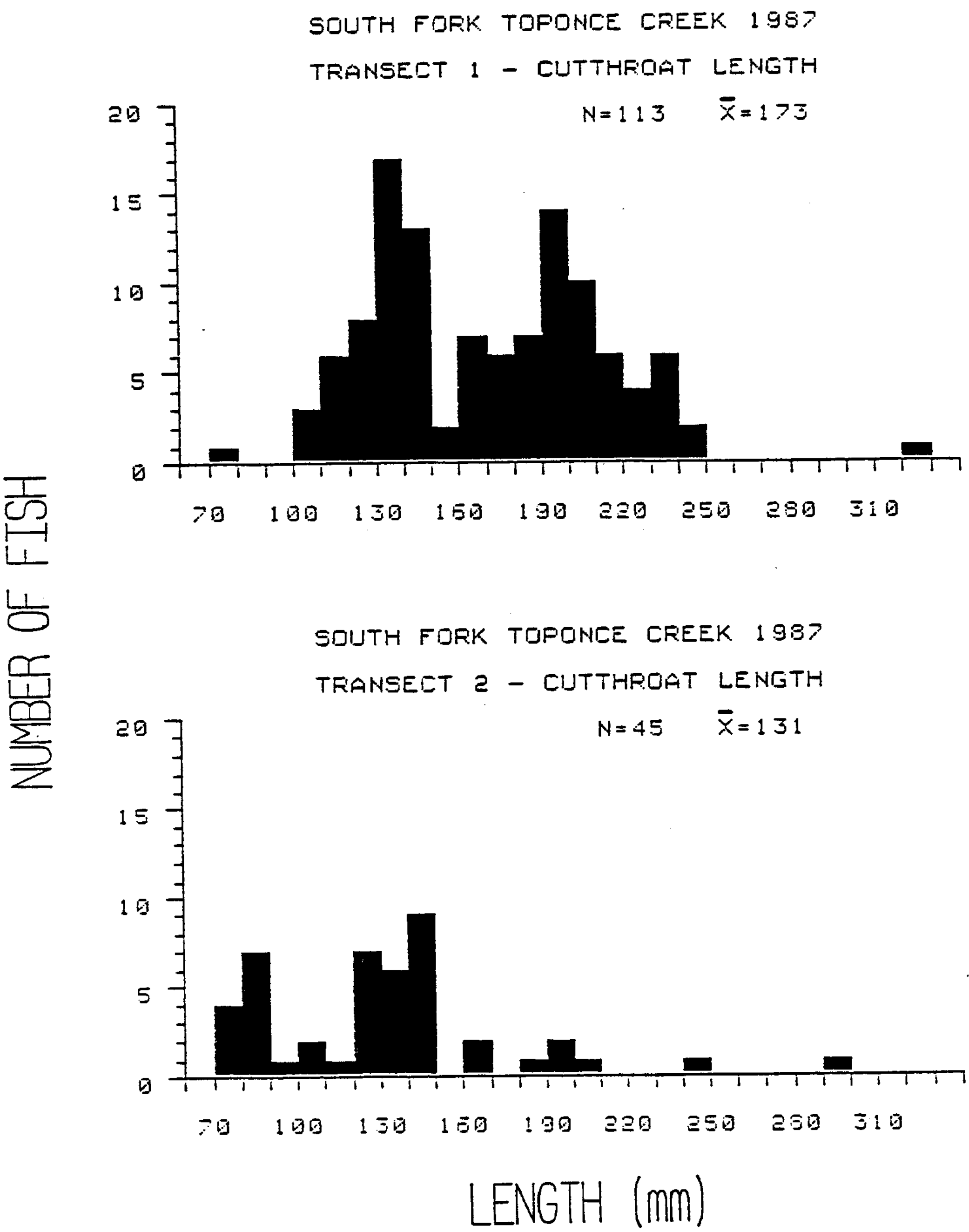

Figure 21. Length frequency distribution of wild cutthroat trout from electrofishing stations on the South Fork Toponce Creek, September, 1987.

The success of the cutthroat trout population in upper reaches of the South Fork may be related to limited angler access. In lower reaches of the Toponce drainage with easy access, they have been largely replaced by the less angler-vulnerable rainbow trout. It is likely that the South Fork serves as a spawning and rearing stream for cutthroat trout migrants from throughout the Toponce Creek drainage.

Spot Creel Checks - Streams

Tabulated results of spot stream creel census checks are given in Table 18.

DISCUSSION

Upper Blackfoot River

The decline of the Blackfoot River fishery from the late 1950s to the late 1970s is well documented. Thurow (1981) reported an increase in total mortality rates for age V+ trout from .56 in 1959 to .69 in 1978. Thurow also reported that the percentage of the catch in excess of 500 mm declined from 20% in 1959 to 4I in 1978. In addition, trend analysis of opening day harvest rates indicate that statistically significant declines have occurred during the past two decades (Figure 6). Our analysis of both redd and spawner counts indicates that substantial declines in spawner escapement to upper valley tributaries has occurred during the last ten years.

Mean lengths of cutthroat trout harvested on opening day has remained virtually unchanged since the opening day check station began operation in 1972 (Figure 7). However, because of the adfluvial characteristics of these fish, we do not believe that mean length provides a meaningful barometer of population status. Angler catch in the river is dominated primarily by juveniles and postspawners. A large segment of the population fully susceptible to angling, resides in the reservoir. As such, any changes in size structure of this substantial population segment are not reflected in the length data presented in Figure 7.

Because of the declines documented above, special regulations were adopted on the entire river in 1985. Anglers were restricted to a three fish bag limit as opposed to the general limit (6 fish) in effect previously. In addition, the opening day on the lower segment of the river below Slug Creek Bridge was pushed back from 6 June to 1 July to prevent the harvest of unspawned females still ascending the river.

Bag limit reductions have long been used as method to reduce salmonid harvest. However, as Hunt (1970) observed, bag limits provide no protection until the limit is reached. The effectiveness of the three fish bag limit as tool for restoring the Blackfoot River fishery should be evaluated in the upcoming field season. Nineteen eighty-eight will mark the first year that increases in spawner escapement should be evident if

Table 18. Anglers interviewed, hours fished, fish harvested, and catch rates from various streams in Region 5, 1987.

Stream and month	Number of anglers checked				Fish harvested							Fish per	
	Resident	Non-resident	Total	Hours fished	Hatchery rainbow	Wild rainbow	Wild cutthroat	Unknown cutthroat	Brown trout	Eastern brook	Total	Angler	Hour
Bear River													
May	35	22	57	166	135	2	1	-	1	-	139	2.44	.84
August	3	5	8	27	4	3	-	-	-	-	7	.88	.26
TOTAL	38	27	65	193	139	5	1	-	1	-	146	2.25	.76
Blackfoot River (Below Dam)													
May	280	76	356	1,178	113	1	5	58	-	-	177	.50	.15
Brush Creek													
May	88	-	88	227	20	2	80	-	-	143	245	2.78	1.08
Cotton Creek													
May	14	15	29	49	-	-	67	-	-	-	67	2.31	1.37
June	8	10	18	45	-	-	38	-	-	-	38	2.11	.84
TOTAL	22	25	47	94	-	-	105	-	-	-	105	2.23	1.12
Cub River													
August	8	6	14	9	6	5	-	-	-	-	11	.79	1.22
Devil Creek													
June	-	14	14	32	10	-	-	-	-	-	10	.71	.32
August	6	9	15	109	61	-	-	-	-	-	61	4.07	.56
TOTAL	6	23	29	141	71	-	-	-	-	-	71	2.45	.50
Eight Mile Creek													
May	10	-	10	16	-	1	1	-	-	7	9	.90	.56
Grizzly Creek													
May	19	-	19	71	12	-	-	-	-	62	74	3.89	1.04

Table 18. Continued.

Stream and month	Number of anglers checked: Resident	Non-resident	Total	Hours fished	Fish harvested: Hatchery rainbow	Wild rainbow	Wild cutthroat	Unknown cutthroat	Brown trout	Eastern brook	Total	Fish per Angler	Fish per Hour
Horse Creek													
May	18	-	18	34	-	-	38	-	-	-	38	2.11	1.12
McCoy Creek													
May	13	5	18	42	-	-	18	-	-	-	18	1.00	.43
Pebble Creek													
June	18	1	19	32	15	-	11	-	-	-	20	1.37	.81
Portneuf River (Above Lava)													
May	231	15	246	958	281	148	138	-	-	-	567	2.30	.59
June	27	4	31	56	23	1	5	-	-	-	29	.94	.52
July	16	5	21	30	9	4	1	-	-	-	14	.67	.47
TOTAL	274	24	298	1,044	313	153	144	-	-	-	610	2.05	.58
Portneuf River (Below Lava)													
April	7	1	8	15	-	-	1	-	11	-	2	.25	.13
Rawlins Creek													
May	81	-	81	146	14	13	108	-	-	6	141	1.74	.97
Rock Creek													
June	18	-	18	40	15	-	-	-	-	4	19	1.06	.48
E. Fk. Rock Cr.													
May	62	-	62	132	147	3	-	-	-	-	150	2.42	1.14

Table 18. Continued.

Stream and month	Number of anglers checked: Resident	Non-resident	Total	Hours fished	Fish harvested: Hatchery rainbow	Wild rainbow	Wild cutthroat	Unknown cutthroat	Brown trout	Eastern brook	Total	Fish per: Angler	Hour
Snake River (Above Amer. Falls)													
January	5	-	5	7	-	-	-	-	2	-	2	.40	.29
February	49	-	49	97	16	2	6	-	1	-	25	.52	.26
March	31	-	31	35	2	1	1	-	2	-	6	.19	.17
May	13	-	13	17	24	-	-	-	5	-	29	2.23	1.71
June	7	-	7	14	-	-	-	-	-	-	-	-	-
TOTAL	105	-	105	170	42	3	7	-	10	-	62	.59	.36
Stump Creek													
May	10	5	15	32	-	-	29	-	-	-	29	1.93	.91
Trout Creek													
May	24	9	33	70	63	-	5	-	-	18	86	2.61	1.23
Twenty-four Mile Creek													
May	139	7	146	520	176	16	1	-	-	23	216	1.48	.42
Whiskey Creek													
May	41	1	42	78	35	-	1	-	-	12	48	1.14	.62
June	5	17	22	35	35	1	-	-	-	2	38	1.73	1.09
July	3	5	8	43	26	-	-	-	-	-	26	3.25	.60
TOTAL	49	23	72	156	96	1	1	-	-	14	112	1.56	.72

Table 19. Total spawners trapped at St. Charles Creek weir for egg-taking operations, 1975-1987.

Year	Numbers of spawners
1975	269
1976	374
1977	96
1978	246
1979	245
1980	305
1981	125
1982	68
1983	183
1984	157
1985	228
1986	90
1987	256

the regulation is successfully reducing mortality rates. The June spawner survey should be continued for the next several years. In addition, population estimates from 15 electrofishing stations conducted during the 1978-1980 project (Thurow 1981) are available for comparison with current population levels. Population enumeration should probably be a major priority in the upcoming field season.

The creel census conducted the past season was too short to provide a meaningful comparison with the season-long census conducted in 1978. A longer census should be conducted in the upcoming field season to evaluate angler effort and more importantly, angler harvest rates in relation to the late 1970s.

We are particularly interested in the extent of current juvenile trout harvest on a season-long basis. Thurow (1981) reported that two-year-old cutthroat trout comprised 45% of the 1978 catch.

Our check station results indicate that juvenile cutthroat 300 mm long or less comprised 49% of the harvest on opening day in 1987. Heavy angler harvest of these fish destined for Blackfoot Reservoir may be limiting spawner escapement to tributary streams.

Salt River Inventory

All cutthroat trout sampled during the inventory displayed characteristics of the Snake River fine-spotted cutthroat, a special concern subspecies native only to the South Fork Snake River and tributaries. As with other fine-spotted populations, a wide range of spotting patterns were evident but all trout exhibited the small and profuse spots scattered over much of the body.

Wyoming's Auburn Hatchery currently plants Tincup Creek with 5,000 fine-spotted fingerlings annually. The Auburn brood fish have been altered over time to a fall-spawning stock that is used primarily in reservoirs and high mountain lakes in Wyoming. We observed no fin deformities on fish during the study and the survival of these plants is questionable. In the future, efforts should be made to evaluate both the success of these hatchery plants in terms of return to the creel, and their potential genetic impacts on the wild population.

Wild cutthroat trout populations in mainstream Tincup Creek stations were comprised largely of fish less than 200 mm in length. Excellent pool habitat for larger fish is present in many segments of the stream as a result of beaver activity. However over 15 km of the stream is bordered by a major asphalt highway and angler harvest is presumed to be high. We recommend that estimate of angler use and harvest be obtained in the near future.

Bear Canyon and the South Fork of Tincup creeks, the two major tributaries to Tincup Creek, have both been impacted by sheep grazing. Riparian impacts associated with sheep grazing are minimal when compared with cattle but trailing and the concentration of animals for driving are negatively affecting portions of these tributaries.

In contrast, the Jackknife Creek drainage is grazed heavily by cattle. Trout habitat on both tributaries sampled (Squaw and Deep creeks) and mainstream Jackknife Creek has been heavily impacted by grazing as evidenced by sloughing streambanks, heavy sedimentation, and limited riparian vegetation. Efforts should be made to work with the USFS and permittees on methods to avoid sheep and cattle concentrations in the riparian zones of the above streams.

Neither Tincup nor Jackknife Creek appear to function as major spawning tributaries for the Salt River brown trout population. We sampled a single adult brown trout in both drainages and captured less than 10 juveniles. In contrast, the Stump and Crow Creek drainages located immediately to the south both function as spawning tributaries for migrant brown trout.

We captured no whitefish within the Tincup or Jackknife Creek electrofishing stations. Heimer et al. (1987) reported substantial migratory whitefish populations in both Stump and Crow creeks. The lack of whitefish populations in the two northernmost streams may be related to their smaller size or to possible migration barriers on lower segments within Wyoming.

St. Charles Creek

The significance of St. Charles Creek as a spawning and rearing stream is unknown. For the past 12 years, IDFG and the Utah Department of Natural Resources have been operating an egg-taking facility on St. Charles Creek near SCCK-l. The objective of this operation is to enhance egg to juvenile survival rates to elevate catch rates in the lake fishery. An average of 203 spawners per year have been trapped at this weir since 1975 when the weir was first installed (Table 19). Twenty percent of these fish have been passed above the weir to spawn naturally. During high water years, an additional unknown percentage of the run gets past the weir.

The egg collection operations on St. Charles Creek have obviously reduced its importance as a natural spawning and rearing stream. In order to evaluate current and potential recruitment to Bear Lake, information on juvenile life history is needed. Migration timing and the size of outmigrants, hereafter referred to as smolts, has never been documented for this endemic subspecies. This information would be especially useful in improving the success of the hatchery program on Bear Lake. Additional study is needed in regard to irrigation diversions and their impact on both the resident fishery and outmigrating Bear Lake smolts. The following items are recommended for inclusion in a study of the St. Charles Creek fishery.

Year 1

A. Operate a downstream trap on Little Creek to document timing and smolt size of fish entering Bear Lake. This data may be obtainable by placing a down box on the existing egg-collection weir and trapping during periods of likely outmigration (spring and fall).

B. Assess juvenile and adult losses of Bear Lake cutthroat to Big Creek using similar methods as in A.

C. Supplement above trapping (A and B) with an electrofishing evaluation of cutthroat movement using marked smolts.

D. Assess possible limitation to cutthroat passage over the two major diversion dams on St. Charles Creek (Upper Diversion and the Transtrum Diversion).

E. Conduct a visual survey (redd counts) of the stream during the cutthroat spawning run to identify principal spawning sites within the drainage.

F. Using staff gauges, monitor irrigation flows in 4 or 5 diversions on the stream. Local irrigators report that this type of quantified data is unavailable. Beginning and ending dates of water use in each diversion, along with this flow data, will be compared with life history information (migration timing) to determine if any individual diversions appear especially detrimental.

Year 2

A. Obtain estimates of salmonid losses (resident and adfluvial) to select diversions using a trapping program.

B. Conduct a habitat survey of the drainage and estimate production potential of the system with screened and unscreened diversions. This topic should also address the impact of exotics (brook and rainbow trout) on potential screening benefits.

C. Obtain estimates of angler use and salmonid harvest in the drainage.

Many of the above items will require the development of a good working relationship with local irrigators.

Appendix A. Spawning survey summaries on upper Blackfoot River tributaries, 1978-1987.[a]

Stream	Date surveyed	Km surveyed	Number of spawners Total	Fish/km	Number of redds Tota	Redds/km
Spring Creek	6/15/78	3.0	82	27.3	225	75
	6/11/79	3.9	49	12.6	--	--
	6/17/80	4.9	110	27.7	156	31.8
	6/3/81	4.4	155	35.0	218	50.0
	6/11/82	1.5	118	78.7	138	92
	6/13/83	7.8	214	27.4	232	29.7
	6/21/84	4.8	18	3.8	4	0.8
	6/13/85	2.1	4	1.9	25	11.9
	6/12/86	5.0	18	3.6	89	17.8
	6/08/87	3.7	15	4.1	27	7.3
Timothy Creek	6/16/78	3.9	52	13.3	25	6.4
	6/15/79	6.3	20	3.2		--
	6/17/80	7.0	135	19.3		--
	6/81	---------------- Not surveyed --------------------				
	6/12/82	0.6	14	23.3	4	6.7
	6/20/83	1 . 9	13	6.8		--
	6/19/84	1 . 2	13	10.8		--
	6/85	---------------- Not surveyed --------------------				
	6/12/86	4.0	18	4.5	12	3.0
	6/11/87	4.0	6	1.5	22	5.5
Bacon Creek	6/8/78	4.4	97	22.1	30	6.8
	6/15/79	6.0	79	13.2		--
	6/13/80	6.0	144	24.0		--
	6 / 81	---------------- Not surveyed --------------------				
	6/12/82	1.1	58	52.7	37	33.6
	6/20/83	1.9	34	17.9	16	5.3
	6/19/84	0.9	26	28.9	12	13
	6/13/85	---------------- Not surveyed --------------------				
	6/12/86	3.5	53	15.1	33	9.4
	6/11/87	3.5	0	0	24	6.9
Browns Canyon Creek	6/12/78	1.9	23	12.1	4	1.3
	6/11/79	5.0	6.0	1.2		--
	6/12/80	3.5	26	7.5	26	7.4
	6/81	---------------- Not surveyed --------------------				
	6/11/82	1.5	14	9.3	3	2
	6/21/83	1.5	6	4.0	4	2.7
	6/20/84	1.6	8	5.0	2	1.3
	6/13/85	1.6	1	0.6	4	2.5
	6/12/86	1.6	1	0.6	6	3.8
	6/11/87	1.6	6	3.8	9	5.6

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Appendix A. Continued.

Stream	Date surveyed	Km surveyed	Number of spawners Total	Fish/km	Number of redds Total	Redds/km
Sheep Creek	6/29/78	2.1	66	31.4	17	8.1
	6/13/79	3.9	13	3.3		--
	6/18/80	6.1	42	6.9	100	16.3
	6/8/81	4.6	6	1.3	55	12.0
	6/18/82	1.3	8	6.2	22	16.9
	6/22/83	3.7	6	1.6	14	3.8
	6/20/84	2.9	12	4.1	10	3.5
	6/13/85	2.5	0	0	22	8.8
	6/13/86	4.3	5	1.2	25	5.8
	6/10/87	4.3	6	1.4	25	5.8
Kendall Creek	6/10/78	1.0	4	4.0	2	2
	6/11/79	3.0	1.0	0.3		
	6/17/80	2.0	10	5	4	2
	6/3/81	0.9	19	21.1	42	46.7
	6/11/82	0.7	48	68.6	16	22.9
	6/22/83	0.7	10	14.3	17	24.3
	6/20/84	---------------- Not surveyed--------------------				
	6/13/85	---------------- Not surveyed--------------------				
	6/11/86	1.5	3	2.0	1	0.7
	6/09/87	1.5	0	0	1	0.7
Timber Creek	6/10/81	1.4	3	2.1	3	2.1
	6/10/82	1.0	23	23	10	10
	6/13/83	2.0	80	40.0	46	23.0
	6/19/84	1.8	10	5.6	4	2.2
	6/12/85	1.8	10	5.6	3	1.7
	6/11/86	1.8	6	3.3	5	2.8
	6/08/87	1.8	0	0	0	0
Stewart Can. Cr.	6/10/81	2.3	1	0.4	1	0.4
	6/17/82	1.8	0	0	2	1.1
	6/13/83	-----------------Not surveyed -------------------				
	6/19/84	1.8	5	2.8	1	0.6
	6/12/85	1.8	4	2.2	0	0
	6/11/86	1.8	0	0	1	0.6
	6/09/87	1.8	0	0	2	1.1
Lanes Creek	6/13/86	1.1	14	12.7	6	5.5
	6/11/87	1.1	0	0	0	0
Lower Diamond Creek	6/11/86	1.6	2	1.3	2	1.3
	6/09/87	1.6	0	0	6	3.8
Diamond Creek Spring	6/12/86	0.5	0	0	38	76.0
	6/08/87	0.5	3	6	21	42

[a] 1978-1980 data from Thurow 1979, 1980; and 1981-1985 data provided by CNF.

JOB PERFORMANCE REPORT

State of: **Idaho**

Name: **REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS**

Project No.: **F-71-R-12**

Title: **Region 5 Technical Guidance**

Job No.: **5-d**

Period Covered: **1 July 1987 thru 30 June 1988**

ABSTRACT

We reviewed and developed comments on activities that would affect gamefish populations. This involved 4 water right applications, 12 hydropower projects and 7 stream channel alterations. The review and comments on these activities required numerous contacts with personnel from different state and federal land management agencies as well as private developers.

Author:

John T. Heimer
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OBJECTIVE

To provide technical guidance to public and private individuals and agencies on matters pertaining to fisheries management in Region 5.

FINDINGS

Water Right Applications

We reviewed three water rights applications covering projects in the Bear River drainage. Two of the projects involved the commercial rearing of trout and one water for livestock. I also made comments on one water right application in the Portneuf River which involved the commercial rearing of trout. All of these project would have a minor effect on fish and wildlife populations. I also attended a water right hearing regarding a hydroelectric project on Williams Creek, a tributary to the Bear River. This project could have serious impacts on fishery resources.

Hydropower Licensing

We were actively involved with 12 different hydropower projects in 1987. This involved 8 on the Bear River, 2 on the Portneuf River and one each on the Snake River and Blackfoot River. Nine of the 12 projects involved at least one site visitation this past year. Often project designs had to be changed or resource assessments done so the project would not seriously impact fish and wildlife populations.

Stream Alterations

We reviewed and commented on 11 different stream channel alterations in 1987. This included 5 on the Portneuf River drainage, 3 on the Bear River drainage and 3 on the Snake River drainages. Generally, these alterations did not have a significant impact on fish and wildlife populations.

Comments on Forest Activities

We had a number of discussion with personnel from the Caribou National Forest regarding their activities and how they would affect fish and wildlife populations. This included assessment of stream resources in McCoy Creek in relation to a proposed road, effects of a culvert on trout in Toponce Creek, grazing activities both in general and those in watersheds containing populations of Bonneville cutthroat. We also attended a workshop on riparian management sponsored by the US Forest Service.

Regional Fishing

We responded to a number of requests for information on fishing in the Region. These responses took the form of letters, presentations at public meetings and verbal contacts.

ACKNOWLEDGEMENTS

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